

DOCUMENT RESUME

ED 321 663

HE 023 681

TITLE Managing Information Technology: Facing the Issues.
Track III: Organization and Personnel Issues.

INSTITUTION CAUSE, Boulder, Colo.

PUB DATE 90

NOTE 66p.; In: Managing Information Technology: Facing the Issues. Proceedings of the 1989 CAUSE National Conference; see HE 023 678.

AVAILABLE FROM CAUSE Exchange Library, 737 Twenty-Ninth Street, Boulder, CO 80303 (entire proceedings only: \$45.00 members, \$75.00 non-members.)

PUB TYPE Speeches/Conference Papers (150) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC03 Plus Postage.

DESCRIPTORS Administration; Communication (Thought Transfer); *Computer Uses in Education; Equipment; Higher Education; *Information Systems; Interdisciplinary Approach; Library Administration; Maintenance; *Organizational Development; Personnel; Staff Development; Student Records; *Technological Advancement

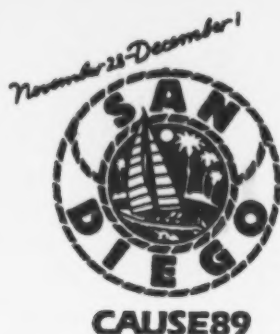
IDENTIFIERS *CAUSE National Conference; Florida Atlantic University; Loyola University IL; University of British Columbia (Canada); University of Nebraska Lincoln; Virginia Polytechnic Inst and State Univ

ABSTRACT

Seven papers making up Track III of the 1989 conference of the Professional Association for the Management of Information Technology in Higher Education (known as CAUSE, an acronym of the association's former name) are presented in this document. The focus of Track III is on organization and personnel issues, and the papers include: "How to Successfully Mix Oil and Water: or How to Get Your Programmers to Work with Librarians" (James J. Scanlon); "Meeting the Challenges in Computer User Support" (Don E. Gardner and Carol S. Schwob); "Bridging the Gap: Designing an Effective User Interface" (Audrey Lindsay and David Smithers); "Office of System and Computer Services: In-House Microcomputer Repair in the College Computing Environment" (Martin Fiebke, Donald Brusk, and Donald Sanders); "Distributing Support--Departmental Computing Coordinators" (Jerry Sanders); "EGADS, we DID it! Employing Global Administrative Distribution Strategies--Data Integrity Distributed" (Jo Powell, Janet Crowder, and Lee Anne Hoppe); "The Center for Emerging Technologies in Computing, Communication, and Human Resources" (B. C. Sandhorst, J. G. Emal, J. W. King, and M. S. Wilhite). An abstract is provided with most of these papers. (DB)

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ED321663



Managing Information Technology: Facing the Issues

Proceedings of the
1989 CAUSE National Conference

TRACK III: Organization and Personnel Issues

November 28 - December 1, 1989
The Sheraton on Harbor Island
San Diego, California

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Track III

Organization and Personnel Issues



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Converging technologies have dictated that institutions view their organization's structure and use their personnel in new and better ways in order to manage the changing information resource function. Not only is it important to determine where information will be created, preserved, and communicated; the choices of how and who will perform the functions and the skills required to perform and manage the functions are critical. Topics covered in this track included: organizational strategies for delivering information technology services; cultural differences among the units involved in the information infrastructure (computing, library, telecommunications); the need for different skills and capabilities in systems development staff in light of new development methods; the evolving role of the information center; and training and productivity issues.



Jim Scanlon, California State University

**How to Successfully Mix Oil and Water:
or How to Get Your Programmers
to Work with Librarians**

by
James J. Scanlon

Information professionals, as any diverse group of individuals, span the whole range of personality types, from the most gregarious to the very withdrawn. Different types of personalities are drawn to different professional types. We are all used to dealing with the typical police or bureaucratic mindset. One of the primary responsibilities of any manager is to ensure that individuals work well in harmony. Generally, computing and library professionals have very different personalities. This paper will examine the personality differences between librarians and computer professionals and further examine several strategies which will allow them to work together. The paper will also examine the present and future relationships of the computer center and the library.

The typical stereotype of the librarian is a little old lady with a bun on the back of her head who is constantly 'shushing' patrons. According to the Myers-Briggs Type Inventory (MBTI), librarians typically are literal, search for total solutions to problems, and place emphasis on authority. On the other hand, computer specialists think linearly, tend to search for the best possible fit to a problem, worrying about exceptions as they occur, and place emphasis on knowledge as opposed to authority when seeking answers.

These two differing personality types serve their professions well. Librarianship is a mature profession with a history going back to Greek and Roman times. Consistency of information presentation is essential for the librarian. One main function of the library is to provide quick and easy access to information for large numbers of patrons. In order to provide this level of access, there must be a high degree of standardization.

One must constantly rely on rules of authority to achieve standardization. Over the years, these rules have served librarians and the general public well. The majority of adults were educated in a system which used library methods to access informations.

Because of the age of libraries, the decision-making processes have become very standardized. This is true of any mature institution. Mature institutions tend to have numerous review committees and very formalized decision-making processes which are indicative of bureaucratic organizations. Generally, since libraries are bureaucratic institutions, reliance is placed on authority as opposed to knowledge.

On the other hand, computer professionals come from a culture that is very young. As typical of young cultures; change is a constant. To deal with change, professionals must adopt coping strategies. Often these

coping strategies solve only a certain percentage of problems in the general situation and then deal with the remainder, on a case-by-case basis.

Computer professionals, as indicative of professionals of any emerging field, tend to shoot from the hip and place their faith in the knowledge of individuals as opposed to their authority within the organization. Authority is a commodity that does not solve the problem at hand; therefore, is of little value.

Getting these two cultures to work productively, is at times, a difficult and frustrating process. Constant clashes occur between the personality types. Procedures which make absolute sense to a librarian make little sense to the computer professional, and vice versa. Conflict seems almost inevitable because of the differences in these interpretations. A case in point would be the library automation system at the University of Georgia. At the beginning of the author's tenure as manager of library automation, there was a great deal of dissention between the library staff and the computer staff. Shouting matches were not uncommon and little respect was shared between the two organizations. Over the course of three years, several strategies were developed to provide a better working relationship between these two groups. These strategies were based upon the following four pronged approach:

1. Develop mutual professional respect
2. Develop mutual understanding of operational needs of the other organization,
3. Develop an identification with the positive results of the other organization,
4. Good problem definition.

At the beginning of the project, the library staff perceived the computer staff as technicians, not as professionals. As technicians, the computer staff's opinions and needs carried a lower weight in the minds' of the professional staff. The genesis of this problem is quite understandable. Often, there is no formalized training for the computer staff, while a professional librarian is required to earn a Masters of Library Science. The difference in educational requirements alone was enough to make this perception widespread.

The key to overcoming this problem from the point of view of the computer staff was to act with a professional demeanor in all contacts with the library staff. When discussing problems, the computer staff was

instructed to deal with the problems in a professional manner. In all situations, the computing staff attempted to portray the professional image and to refer to themselves as professionals.

From the point of view of the library staff, the professional image of the computer staff was built by the management of the library. When talking about the computing staff, they were referred to as professionals. When a decision needed to be made, the management staff would often refer to the expertise of the technical staff. This leading by example was very helpful in building the image of the computer professional as a true professional.

The second step was to develop a mutual understanding of operational needs of the other organization. Due to the diverse backgrounds and missions of computer professionals and librarians, there was difficulty understanding the professional concerns of the other group. As stated previously, the major interest of the library staff is to ensure constant and consistent access to information. It should be noted that the key words for library staff members are constant and consistent. These two words require a high degree of uniformity in operation. This overriding requirement for uniformity has led to the requirement of librarians to require solutions which allow for all of the cases. When an unusual cataloging problem occurs, it must be dealt with immediately. It cannot be handled on an exception basis, but as a part of the routine function of the library.

The computer professional deals in a world where there is constant change. This is not only due to changes in the external environment and the work requirements of the supported systems, but those changes due to random occurrences. It is possible for a computer program to be changed due to the chance passing of a cosmic ray through the wrong part of a computer chip. Because of the extremely variable world of the computer professional, only the most common cases can be handled on a routine basis. All others must be handled on an exception basis.

Just as the library and computer professionals must recognize each other as different types of professionals, this recognition has its own set of professional concerns. Discussions of all problems and solutions should focus on the professional concerns of both communities. The computer professional is concerned with the stability of the system and integrity of the data. On the other hand, the librarian is concerned with the accuracy of the data contained in the system. These two sets of concerns are often at odds with one another. Decisions need to be made where there is a win-win solution regarding the professional concerns of both communities.

The bottom line of each of the two professionals is the same: "The provision of information in a timely and accurate manner." Because the end is the same, each group should identify with the positive results of the other. A system which handles the inter-accuracies of the relationships of serials designed by a librarian should be greeted with a high level of enthusiasm by the computer staff. On the other hand, an operational fix allowing for the recovery of data which is apparently lost should be appreciated by the library staff.

When developing a common language between the two staffs, it is incumbent on the computer staff to learn the language of the library staff. The jargon of the librarian may seem arcane, but it has a precise meaning for professionals in this area. The computer staff should learn the language of the user to allow the computer staff to do three different things. It helps the computer staff to associate more closely with the needs of the library staff to understand the logic behind the language. The second reason is that it allows for easier problem identification and solution. It is much easier for the user to explain the problem in a language in which he is accustomed, than to try to explain a problem in a language that he really doesn't understand. The third reason is that it helps build the professional image of the computer staff because the computer professional has learned language of the user, and in the process, gained new empathy with the user.

One method for developing this type of positive attitude toward the successes of other organizations is to hire staff from the organization or to allow that organization the opportunity to become involved in the solution of a problem they are facing. The former library staff member could often speak the language of the user much more easily than the general computer staff. An unanticipated benefit of using library staff as professions is to get at the other side of the questions. When one of the computer staff would complain about a perceived library problem, the former library employee would say, "But you just don't understand." From this rather startling statement, will come a new understanding of the operational requirements of the library.

Problem definition became a very big issue between the two groups. The library staff, being excellent problem solvers, would present problems in terms of solutions rather than as problems. This attempt to solve the problem before it was well understood generally yielded poor results. From the point of view of the computer professional, was that what often appeared to be a rational, intelligent solution to the real world would not work in the computer environment.

To assist in the problem definition, a great deal of time was spent in meetings where all aspects of the problem were well understood. When these problems were well understood, solutions would be discussed. This discussion process was often lengthy and stressful. As a result of this process, problems were solved which were agreeable to all parties concerned. By defining the problem in a manner understandable to all, a large step was taken in the solution of the problem.

To make these four coping strategies work required the full cooperation of all levels of management in both the library and the computer center. It was the expressed commitment of the directors of both departments that full cooperation between these two would exist. More than a commitment was made by these two individuals; they were occasionally called upon to intervene in situations out of control. From the commitment of the senior managers, the junior management followed with the active encouragement and cooperation.

In the final analysis, it was through the dedication of both organizations that a common professional ethic was achieved to deliver a service to their user community as it was needed. The professionalism of both organizations was the deciding point. The role of management was to demonstrate how this professional ethic could be achieved to improve communications between organizations.

These steps are applicable to all groups using the service of computer professionals. It should be remembered, the main goal of the computer professional is to achieve success through the success of the user community which he/she serves. A computer professional can design the most elegant system imaginable, provide instantaneous response time, and have 100% machine availability; but if the user cannot use the system, it is valueless. The key to a valuable system is to increase communication with the user.

Meeting the Challenges in Computer User Support

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The establishment of the microcomputer as a standard desktop tool, coupled with ever-increasing access to computer networks, has resulted in significant challenges in campus computer user support. Typically, the institutional response to these challenges has been shaped by the previous orientation of the responsible office: e.g., administrative vs. academic computing, or a history of mainframe vs. mini/micro support. This presentation describes a case study where a new "Computer User Services" department, completely separate from administrative computing, academic computing and the information center/MIS department, was created in an effort to provide a source of "application-neutral" user support. Problems and solutions are discussed, including the benefits of the approach and recommendations for those interested in pursuing a similar course.

In a short ten years, microcomputers have become the single most important tool -- aside from the telephone - in most administrative offices in higher education. At the same time, desktop computers have provided myriad opportunities for enhanced academic instruction, research and public service. One result of this literal revolution is the emergence of a new breed of computer consultants and a variety of new offices aimed at providing microcomputer support to campus computing users.

Most of these support organizations have evolved in obvious ways: for example, out of the traditional academic or administrative computing departments within the college or university. Others have become extensions or integral parts of Information Centers or MIS departments, where attempts have been made to adapt business concepts in the college setting. In every case, a series of new challenges must be addressed in some way:

- . Guiding the transition from a "machine-centered" to a "user-centered" computing environment,
- . Making all campus computer users citizens (or potential citizens) of an integrated data network,
- . Dealing with the issues of hardware and software standards,
- . Managing technological change with some semblance of rationality,
- . Meeting user education and training needs, and
- . Maintaining effective support sub-groups (for example, network user groups, computer stores, computer maintenance shops, special interest groups, etc.).

The Challenges:

The challenge of effectively guiding the transition from a machine-centered to a user-centered computing environment is dependent on the extent to which campus computing professionals acknowledge a fundamental change in computer user status.¹ In the old computer environment the mainframe (whether academic or administrative, or both) was at the center of activity, with computer experts working diligently to help users access "the machine." In the new computing environment, campus mainframes are simply one of many computing platforms -- including minis, high-powered workstations and microcomputers -- available to help users accomplish their tasks. While some have been slow to recognize it, the focus has clearly shifted away from the technological bulk

¹The authors are indebted to Arthur S. Gloster, II, California Polytechnic -- San Luis Obispo, for his presentation, "Establishing an Information Resource Management Organization," in An IBM Seminar for College and University Executives, November 3, 1988, Oakland, California.

of major computing centers to the individual computing needs of the user, which typically can now be satisfied in a variety of ways.

This being the case, the real hub of activity from a hardware standpoint becomes the network, which leads to the second challenge outlined above: that of **making all campus computer users citizens (or potential citizens) of an integrated data network**. In this context it is not necessary to define an integrated network from a technological standpoint. Regardless of how it is achieved, providing general "any to any" device communication is, or will be, a requirement at most campuses.² The focus here is on the difficulties associated with providing flexible, easy-to-use network access to a group of users with such widely disparate needs, interests and levels of sophistication.

The challenges relating to **hardware and software standards** have been widely discussed in other settings. Suffice to say here that whatever size computer user support staff is available, it will only be able to effectively assist users with so many hardware configurations and software packages. Selecting good hardware and software standards and making them stick is both an art and a science.

Managing technological change with some semblance of rationality is perhaps the most frustrating challenge from a budgetary point of view. As each new generation of hardware and software bursts on the scene, top university administrators may have reason to believe that computers are a kind of "racket," with periodic payments required for "protection" from the dire consequences of being left out of the next level of technological advancement.

Unfortunately, the pace of technological change continues unabated, although the rush to adopt the latest new thing appears to have slowed temporarily while users either work to catch up learning to use what they have, or are content with tools that are generally adequate. The challenge, of course, is to help identify hardware and software migration paths that both protect current investments, while allowing users to advance at a rate that needs and desires demand.

A major part of the current investment in microcomputer technology is in training. **Focusing on user training needs and keeping pace with them as they evolve is a major challenge**, since it takes time and money to bring a large group of users to a significant level of expertise on any software package. Furthermore, each level of competence provides a window on further possibilities, which makes this a never ending process. At the same time, employee turnover insures that there will always be a need for introductory courses.

The final challenges we have identified are in the areas of microcomputer hardware support. In spite of challenges from small businesses and the questions relating to unrelated business income tax, manufacturer education discounts have put most support centers in the position of **running some kind of computer store and providing some level of microcomputer maintenance**. Store operations range in scope from offices

²At Florida Atlantic University, the technical challenge has been to integrate three separate data networks with four different protocols into a single entity from a user standpoint. This is being done with gateways and protocol converters, using TCP/IP on the fiber optic-based Ethernet network.

which simply verify eligibility and hand out forms for users to return directly to the vendor, to full scale store front operations with large inventories of equipment. The ease with which most microcomputer hardware problems can be diagnosed and repaired makes maintaining some level of repair facility almost irresistible. Both kinds of operations have introduced a whole new set of management problems and challenges in campus computing.

The Case Study:

In 1987, a State University System of Florida review team conducted a comprehensive study of computing at Florida Atlantic University and published its report. In addition to recommending a new division of Information Resource Management bringing the various computing departments under one cabinet-level administrator, the team recommended creation of a new End User Support Center supporting both administrative and academic computing users.³ After the new Associate Vice President for Information Resource Management was hired in 1988, he began immediately to implement many of the review team recommendations, including the creation of the new Computer User Services Department.

The Associate Vice President agreed with the review team's observations that a lack of coordination and direction had resulted in a wasteful and confusing use of resources. Individuals in both computing departments were providing the same kinds of services, but often with conflicting results. The person a user would call for help depended almost entirely on who they knew, rather than who might be best qualified to satisfy their needs. The two existing centers supported different networks with different communication protocols, in spite of the fact that many users had both academic and administrative functions to fulfill. Also, different software orientations resulted in serious incompatibilities in sharing electronically stored information.

While theoretically desirable, the review team's recommendations with regard to the functions of the new Center were impossibly comprehensive. Ultimately, within the broad mission of providing "responsive, high quality technical support to Florida Atlantic University computer users," the following five specific goals were adopted:

- . Provide reliable, competent advice to faculty, staff, and students on hardware configurations, application software and network connectivity for microcomputers.
- . Offer low-cost hardware maintenance services for microcomputers that will minimize user down time when repairs are necessary.

³Roberta Maddox, Information Technology Resources at Florida Atlantic University: Report and Recommendations (Tallahassee, Florida: State University System of Florida, September 18, 1987), p. 27.

- . Provide effective low-cost training on microcomputer software products and use, as well as DEC VAX (mainframe) computer use.
- . Coordinate campus hardware and software standards, and obtain the most advantageous pricing possible (through site license agreements, etc.) for products to assist individuals and departments minimize costs.
- . Serve as a bridge between users and the technical systems people at the Computer Centers. Computer User Services personnel understand the technical foundations, capabilities and limitations of computers at Florida Atlantic University, and can help individuals apply computer technology to his/her day-to-day tasks.

The personnel and support dollars for the new department were literally carved out of the existing Administrative and Academic Computing departments. Identification of the personnel to be reassigned was relatively easy, given that both departments were already engaged in the kinds of support activities envisioned for the new unit; the individuals involved were simply given the opportunity to be part of a combined operation in which they would be doing essentially the same things. The timing was perfect for shifting the necessary budgets, since the directors of both of the existing departments had resigned just prior to the Associate Vice President's arrival. A former Assistant Director of Academic Computing was reassigned to head Computer User Services, and the department was on its way.

Staffing Problems:

Today, after one complete year of operation, the Computer User Services Department at Florida Atlantic University is firmly established and moving forward in the fulfillment of the goals identified above. The effort has not been without problems however, and some lessons have been painfully learned.

The first of these had to do with the consequences of putting together a user services staff from two very different computing environments and dealing with their resulting "identity crisis." The composition of the original Computer User Services staff members was two from Administrative Computing, five from Academic Computing, and one contract employee from a Regional Data Center.

The Administrative Computing personnel were accustomed to a one-vendor environment where technical problems were solved by calling in the vendor's marketing representative or engineer. These consultants were used to dealing with administrative personnel with tight deadlines -- most tasks were "emergencies," and priorities were established based on the user's rank in the University rather than on the relative severity of the problem. The administrative users had generally been given whatever they asked for, rather than following a strategic plan for campus computing.

Network connections for administrative users had been accomplished by running individual coaxial cable from a controller in the Administration Building to the user's office, wherever it was located. The cost of coaxial cable and distance limitations kept the number of administrative network users stable. In this environment administrators got immediate service, and since long-term goals were never addressed, they were the recipients of many one-of-a-kind, support-intensive microcomputer programs. For example, the consultants spent a great deal of time producing customized sets of mailing labels for various administrative offices.

On the Academic side, personnel were experienced in a multi-vendor environment. An Academic network was in place, based on Ethernet 802.3 technology. It was widely used and included both VAX/VMS and UNIX systems (including Hewlett-Packard, SUN and AT&T workstations) as well as a variety of microcomputers and terminals connected both directly to the network and through network servers.

Unlike the crisis environment of the administrative users, large projects with tight deadlines for academicians could usually be anticipated and planned for. While academic users often indicated emergency status for their requests, meeting deadlines was generally not as critical as on the administrative side. Consequently, some of the academic computing consultants had a very casual attitude toward consulting and user problems in general.

A major staff-related problem at the beginning had to do with salaries. There was a historical disparity in salaries between the two departments. Other staffing problems emerged during the process of assimilation. The Academic Computing Center had generally enjoyed a reputation as a successful, technically competent department. Personnel who moved from Academic Computing to Computer User Services had to give up some of the glory associated with their old reputation to build a new one. (The present location of the department is in the same building and in the same hallway as the Academic Computing Center so some of these identity problems still persist.) At the same time, the administrative computing personnel needed to be accepted into the group, and everyone had to participate in an exchange of system-specific knowledge.

Cross-training and sharing of clientele were other initial problems. The former administrative consultants generally viewed administrators as THEIR clientele and were not anxious to take on the diversity of academic-type problems. On the other side, the former academic consultants were not terribly anxious to take on problems viewed as "office-related," such as helping someone print labels, fix envelope jams in laser printers, and so forth.

Policies and Procedures:

Computer User Services first had to establish an organizational structure. The next order of business was to establish working hours and expected work routines. As indicated above, personnel were used to very different management styles. After general departmental policies were in place, procedures for each of the three sub-areas in the organization structure were established: **Training, Maintenance, and Consulting.**

Training. One of the first things decided was that it was important to set up internal training criteria and procedures for staff development of the Computer User Services staff BEFORE attempting any expansion of training for campus computer users. For example, the chief maintenance person was sent to a one-week seminar to learn the finer points of repairing microcomputers. In turn, he was required to give a one-day seminar to the rest of the staff. Every staff member had to take a PS/2 and an AT style system apart, identify the boards and components, and put them back together. Following the same philosophy, other staff members attended local application seminars such as SAS and Desk Top Publishing, and vendor presentations on the Macintosh and IBM AS/400. Every other week, the department has an in-house technical seminar on pertinent topics such as LaserJet Printers (including Postscript printing), downloadable fonts, network connections, Campus Network Design, UNIX to VMS gateways, using the Kurzweil Programmable Text Scanner, and so forth.

With a program for internal staff development in place and functioning, Computer User Services proceeded to expand the training offered to university microcomputer users. Examples of the courses that were being offered include: Introduction to Microcomputers (including DOS), WordPerfect Beginning, WordPerfect Intermediate, WordPerfect Advanced, WordPerfect Special Topics, DBase, Lotus 1-2-3 Beginning, Lotus 1-2-3 Advanced, Hard Disk Management, Backup and Restore Techniques, and Desk Top Publishing.

When one of the original staff left the University to relocate out of state, it was very difficult to replace his skill level. During the long recruitment process, a grant was negotiated to partially fund a certified trainer to teach faculty and staff. Because of the success of that program, the grant has been expanded to support 1.5 FTE positions. Computer User Services now has a part-time certified trainer with an office management background who concentrates on office-type seminars and courses including specialized topics such as WordPerfect mailmerge, printing three-up labels, among others.

Another method used to augment the number and frequency of training courses offered was a significant increase in the number of courses taught by persons of expertise from outside the department. For example, the Computer Science Department had requested that Computer User Services offer mini-courses in programming languages not taught by their department. Consequently, part-time specialists have been hired and courses have been successfully offered in such topics as "C" and FORTRAN. These classes typically have had full registrations the day they are announced and have required waiting lists.

Maintenance. An early and major undertaking of Computer User Services was to set up a new Computer Maintenance Service Auxiliary to repair and maintain campus microcomputers and peripherals. Starting the Auxiliary required first a list of standard supported hardware be produced, prices were established for agreements and repairs, a proposal written and presented to the President's cabinet, then the proposal went to the Board of Regents for approval. When the Board of Regents approved the new Auxiliary, a document explaining services and charges was prepared and distributed on campus. A

new technician position was established, which involved generating a position description and bringing in enough capital to cover the technician's first year salary before recruitment could take place.

Although the initial charges were undoubtedly too high (based on the need to cover the technician's salary), the maintenance auxiliary has been successful. After the auxiliary was set up, a new microcomputer burn-in and installation service was instituted for campus users for a nominal fee. The fee also covered preliminary diagnosis and pick-up and delivery for warranty repairs. Whenever possible, loaner equipment has been provided to keep users up and running while their equipment is being repaired.

A second major undertaking has been the set-up of a **Computer Support Lab and Productivity Center**. This Center provides demonstration equipment and software for students, faculty, and staff to test and to learn about computer equipment before making purchasing decisions. The products represented in the Productivity Center to date are IBM, Apple, DEC, NeXT, and Hewlett-Packard. The hardware and software available for demonstration will be continually updated, depending on new announcements from computer vendors.

Part of the Productivity Center is the **Florida Atlantic University Computer Store** where vendors offer systems to students, faculty, and staff at educational discount prices. The Productivity Center also offers a method to obtain campus standard software at educational discount prices. In addition to providing Florida Atlantic University with a central place to discuss computer options, to exchange computer information, to demonstrate new technology, and to explore network connectivity issues, the Center offers other services. The Kurzweil scanner is a programmable text-only scanner which can be "taught" to read material printed in a foreign language, or text in different printer fonts. There is also a graphic scanner available for use.

Consulting. The consulting group has been the most problematic of the three areas within Computer User Services. The principal difficulty has been in clearly defining duties and then finding qualified personnel who are flexible enough to cover microcomputers through mainframes, and technical programming through office automation applications. From the beginning, the consultants were required to have experience with mainframe computing, with microcomputer computing as a secondary skill. The philosophy was that if a consultant is expected to be able to ascertain whether a user computing need might best be satisfied on a mainframe or a microcomputer, the consultant must understand the entire computing picture.

Other problems experienced in the consulting area include: (a) **Software Standards**. When it was announced that WordPerfect would be the campus word processing standard⁴ the choice was backed up by surveys and microcomputer magazine ratings. However, there were still some very unhappy Wordstar and Displaywrite users. (b) **Cross-Training**. As indicated earlier, a consulting staff concept was followed instead of relying on individuals to be the sole expert in any one area. All members of the staff

⁴It was already the de facto standard, with approximately two-thirds of the university word processing market already cornered.

were given primary and secondary responsibilities for supported software. This has been difficult to accomplish because of the demands on staff time, and the natural tendency for people to specialize in their favorite area. The new Productivity Center is expected to assist since new software and hardware will not be installed or remain on just one person's desktop system. (c) Help Desk. The intent has been to establish a user hotline, i.e., an easy to remember number for all campus users to call with computer questions and problems. While the number exists and functions to a certain extent, employee turnover and other problems have made success in this area difficult to obtain. (d) Computer User Database. At the outset, the Associate Vice President directed that a computer user database be established to keep track of individual user hardware configurations and software revision levels. A software package was purchased for this purpose, but again, employee turnover has prevented it from being fully implemented. (e) Network Connectivity Issues. The campus IBM S/38 has been successfully connected to the campus network by a gateway system. However, until very recently, we haven't had the necessary staff to solve the problems associated with keyboard mapping.

Successes in the consulting area have included: (1) establishment of a User Bulletin series for important announcements and distribution of university-wide documentation, (2) expansion of university site-licensing for microcomputer software (for example, in a six-month period, 570 packages of WordPerfect were distributed at a savings to the University of over \$30,000), (3) creation of independent user groups (because it is not possible to support all applications, independent user groups are sponsored to augment the consulting staff), and (4) opening a Computer Support Lab and Productivity Center where faculty, staff, and students can try out a wide range of software and hardware before purchasing.

Criteria for Success:

The following criteria were identified to measure overall success or failure: Are the functional goals being met? Are users receiving reasonable levels of service? Are the anticipated efficiencies of operation being achieved? What end user problems have been effectively solved or addressed?

The scorecard so far has shown significant evidence of success: the Help Desk hotline logs an average 120 calls per week, the equivalent of two maintenance personnel are consistently busy, Computer User Services training classes are in constant demand, users (who are not shy about expressing dissatisfaction) appear reasonably happy, real dollars have been saved through more effective software site licensing, and the Productivity Center is open and operating.

Lessons and Recommendations:

Some of the obvious lessons learned were: the cliché that computing is a constantly changing environment is more true than ever; it is necessary to constantly train personnel; computer software consultants must continually be reminded it is as

important to SHOW the user the solution as it is to fix the problem (better yet if the user can be taught to fix the problem the next time it occurs); that there is no such thing as "settled" or "all fixed"; and there still is not enough time in the day to accomplish everything -- which means setting priorities and sticking to them is essential.

Some of the most conspicuous mistakes included not remembering that higher salaries do not necessarily make employees happy, starting out with maintenance contract prices too high, and relying too extensively on part-time help.

Most notable successes included: starting with a clear mission statement and goals, hiring professional teachers with specialized computer training and sending the consultants to special training seminars and classes before allowing them to teach (it is a mistake to expect someone might be a good teacher just because they are expert programmers), separating the training group from the consulting group, and setting up the Help Desk hot line.

In terms of recommendations to others, overall the Computer User Services Department at Florida Atlantic University has been a success. It might be argued that there are still significant differences between pure administrative users and pure academicians. However, an extensive data communications network which offers the same menu of services to all, effectively blurs the distinction between types of users -- and some clearly wear both hats. The experience at Florida Atlantic has confirmed that there are economies to be realized, and that progress toward a university-wide community of computer users is an achievable goal.

Bridging the Gap:
Designing an Effective User Interface

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As information systems professionals we are totally immersed in systems technology, at work and probably also at home. We are comfortable with computers and excited about pushing them to the limits in order to solve our institution's problems. Typically, we design and build large centralized administrative systems. On the other side of the gap are users who differ widely in their impressions of the systems we deliver. On the one hand, there are those who are not at all comfortable with computers and find our systems intimidating, frustrating and difficult to use. On the other hand, there are those who have had a variety of microcomputer experiences and find our systems lacking in sophistication and "personal" flexibility.

This presentation will describe our experience at the University of British Columbia in developing a consistent, flexible but realistic user interface for a student information system. We will discuss such issues as screen design standards, on-line help, on-line procedure manuals, programmer creativity vs standards and managing user expectations.

1. What is the User Interface?

In a very simple sense, the user interface is everything with which the user has to interact in order to use a computer system. However, in this presentation we wish to concentrate on the kind of user interface you should consider for large, custom-developed systems in a mainframe environment, where you seldom find a good user interface. Therefore, our definition of an effective user interface has three components: the integration of systems and procedures, on-line documentation and the application of consistent design principles.

The Integration of Systems and Procedures

To integrate systems and procedures we must begin by deliberately designing the system and the office procedures at the same time. In fact, in a student system we also have to consider the student procedures, since students are users of a system just as much as the staff in the Registrar's Office or the faculty in the Biology department. Therefore, forms, paper flow, instructions and screen design should be seen as one "system" and designed as an integrated whole. Our users, students included, are becoming more educated in the use of systems and are demanding this degree of sophistication. We, as system planners, system designers and system managers, must respond to this challenge and broaden our definition of the system.

However, we must also be cautious and not attempt to automate everything in sight. Designers should be taught that the initials IBM could also stand for "it's better manually"! In other words, expanding the definition of the system does not imply that the computer must do all of the work. Analysts must apply their talents to the human side of the interface as well as the computer side. This begins the bridging of the gap.

Another way to bridge the gap is to realize that tables and codes belong to the users, not to the system. In the early days of systems everything was encoded in pursuit of the elusive goal of system performance. Today, we encode values to improve the human performance, by saving keystrokes and time. We can only achieve this goal if the users can easily remember the codes or easily find the correct codes. As information system professionals we seem to have a talent for developing cryptic codes for nearly everything in our environment (DBMS, CASE, 4GL, JCL, DFD, DED, TP, PSD, PDS, VRU...). Somehow most of us even manage to remember what these codes stand for. Yet when we apply this talent to encoding values in our systems we manage to develop codes like "7-01-90-290" to mean Master of Arts in English! We still believe that numbers take less DASD and less CPU (there's those codes again) than ordinary English language words. In the broader definition of the system, this just isn't true. A consistent, meaningful, user-defined and user-maintained coding structure is a first step on the way to bridging the gap between the human being and that binary CPU deep inside the blue box.

On-line Documentation

The next step is to put as much of the information as people need to effectively use a system right at their finger tips, which are on the keyboard (or maybe a mouse, or even a touch screen). The way to do this is with on-line documentation. This does not mean that we should rush out and take the Microsoft Word or Word Perfect files from which we print our manuals and put them in a file on the mainframe for users to read. In mainframe systems you don't have the different font sizes, boldface type, graphics and other layout aids you find on a PC. On-line documentation has to be carefully designed, using very different concepts than printed manuals. At minimum, a good set of on-line documentation should encompass:

- screen help
- data element help
- error message help
- prompts
- integrated procedure manuals
- training tutorials

Many PC software packages now offer these aids; why shouldn't our large mainframe systems?

Consistent System Design Principles

The primary objective of applying consistent system design principles is to put the user in control at all times. Too often we develop systems which appear to users to have a mind of their own. For example, we realized that in the first set of screens we developed pressing the enter key would in some cases update the screen you were on and then take you to the next screen; in other cases it would update the screen you were on and then clear the screen for the next entry; and in yet another case it would update the screen you were on and re-display the updated record. It all seemed logical to us because we knew which screens were in "threads" and which handled multiple records, but the users pointed out that there was nothing on the screen to tell them what action pressing enter would cause. They felt the system was in control.

To address these concerns, our interface definition insists on standard screen design principles, such as letting the users know what function they are in, single function screens, adherence to screen standards, menu-driven applications, consistent terminology for captions, prompts, etc., consistent navigation rules and consistent use of navigation aids like PF keys. We will describe later how we defined these standards and rules.

2. Why Design an Effective User Interface?

We believe that there are two key reasons why it is necessary to design an effective user interface. These are to meet the constantly changing user expectations and to achieve a more efficient use of resources in developing and supporting information systems.

To Meet User Expectations

The expectations which users have for systems are often very different than those of the system designers. If we are to meet these expectations, then we must begin to understand our users better. This process begins with understanding our environment. For example, UBC is a large public university with approximately 30,000 students in 12 autonomous faculties, including arts, science, professional faculties and graduate studies. Each faculty has distinct requirements for student information and distinct approaches to what, in other universities, may be common procedures. Thus, a single approach to certain system functions would not meet the users' requirements.

In addition, we were involved in the custom development of a student information system in a large mainframe environment, which entailed a migration of the system from a 1970's batch approach to a fully interactive, on-line environment (IDMS/MVS). We used a structured approach to phase in the new system, first developing a Touch Tone Telephone registration system (an application with high visibility in the community), then reviewing all student systems to develop a plan for replacing the remaining old systems in several subsequent phases. The users who best understood the existing batch system therefore lacked the on-line experience to effectively contribute innovative ideas for a new system. Nevertheless, we had to consider the needs of these users as well as those who were ready to make a giant leap into the twenty-first century. Only by carefully designing the user interface can you meet the expectations of such divergent groups of users.

In any organization you will find that the users of a system have different and changing skill levels. For example, we had some experienced people, both faculty and staff, who used the registration system frequently, understood its functionality well and were eagerly awaiting more of the same. On the other hand, we had many infrequent users who lacked confidence in using computers and didn't know what the system could do for them. There was also a large group who had been using an on-line system on a different mainframe which suffered from slow response time and limited functionality. They were prepared to use the new system, but with a certain vocal skepticism about its ability to do the job.

However, their lack of enthusiasm was easily offset by a small but growing group of PC-literate users who saw the PC or MAC as a solution just waiting for every problem. Why couldn't the mainframe have pull-down menus, pop-up dialogue boxes, multiple windows, graphics or icons and still have sub-second response time, they asked.

Finally, there was the diehard group with only batch system experience. Their idea of the user interface was to "cram" everything on one screen, replicating their coding form which had ten or fifteen different transactions on the one form.

Recognizing these different skill levels still wasn't enough. We had to try to ensure user ownership of the system. The initial 6 months in the life of a system are critical for its long term success. A sense of pride and ownership must be developed during the design stage to ensure that user support will be there to iron out the initial growing pains that any new system experiences. In order to achieve this sense of pride and ownership, the users need to feel that they played a key role in the design of the system and that their ideas were listened to and addressed in the system which is finally delivered. Developing this ownership means that the project team must learn to approach tasks from a user point of view rather than an analytical point of view. For example, a system designed according to all the rules of accounting principles may keep the auditor happy but will fail miserably if it is too complex for a clerk, the primary user, to understand.

Efficient Use of Resources

Every project manager is interested in making the best use of resources in delivering a system. At first glance, designing a user interface as we have described may appear to increase costs, particularly in the design and development stages of the project. However, a closer examination of most projects will show that a large portion of the team's time and the project's budget is spent on creating user manuals, conducting training sessions, and distributing replacement sections of the manuals as the system is modified. Adhering to consistent design principles and including on-line documentation should reduce the number and the size of printed manuals, reduce the number of training sessions and reduce the cost of distributing, updating and replacing documentation. The results should be a more user-oriented system for the same resources.

In addition, maintaining an adequate level of funding for large central systems at universities is always difficult. The system is expected to support the unique requirements of the individual faculties and departments, as well as those of the "centralized" administrative departments. Yet as soon as faculties believe they are not being served adequately, they may "steal" the funding to develop their own unique PC-based solutions. Developing a quality system from the users' point of view can often prevent this duplication of effort and provide cost-effective solutions for all users.

Another hidden cost of training and documentation surfaces once the system has been in production for some time. The frequency of user training sessions and the new releases of documentation decrease and new users to the system are left to struggle with learning the system on their own, frequently using outdated paper documentation. For example, the department that attended the most training sessions and collected the most manuals during our initial project is still the least knowledgeable on campus. They frequently complain that the system won't do what they want, simply because they do not know that a feature exists. Is this their fault? Probably not. In hindsight, we recognized that those people were probably the least computer-literate group of users, had difficulty absorbing everything in the training sessions and thus had limited knowledge to pass on to new staff. With on-line assistance, new users will be more likely to be aware of the system features and continue to be satisfied with the system longer.

3. How to Design an Effective User Interface

As we have indicated, we are now developing the second phase of a student information system. We have learned from our mistakes on the first phase and have begun to apply some of the concepts we have discussed so far. As a result of these experiences, we believe that the key factors in designing an effective user interface are establishing interface standards, ensuring extensive user involvement and recognizing the cost of training and documentation.

Establish User Interface Standards

The first step is to develop a standards manual. This is not an easy task. We asked several senior analysts on the team to write position papers on each of the elements of the user interface as we defined it in section 1, such as help, table strategy, screen standards, etc. These papers took into consideration some of the standards we had already developed in Project 1, the ideas we had gathered from the users and the ideas we had discussed as a team. The position papers discussed different ways of implementing the concepts and their technical considerations and made recommendations regarding the best approach. We had numerous meetings with the team leaders and several all-day sessions with the whole project team and user representatives. The entire process spanned several months, during which time we were also completing the functional design of the system.

Just when we thought we had a standard pinned down the old question, "Is it a standard, a rule or a guideline?" would surface. (We found that a standard was something you had to do, a rule was something you could break, and a guideline was something you could ignore!) There were always reasons why the standard didn't apply to a certain situation or became technically difficult to implement. At some points we wished that we had had a standards appeal court with all the bureaucracy to discourage team members from wanting to re-open the standards discussion. What we learned, however, is that a certain degree of flexibility is necessary both in developing the standards and in enforcing them, although knowing when to stop the research and publish the standard is difficult in this environment.

In the end, we also found that time and resources did not permit us to implement every design concept we had considered. So we tried to set achievable goals and focus on those concepts which would best contribute to an effective user interface at a reasonable cost. We chose to implement a meaningful coding structure with easy table look-up, consistent screen design principles, screen help, data element help and a limited set of prompts. These provided the basis for the other aspects of the user interface which we hope to add in later projects.

Ensure Extensive User Involvement

Having developed the standards, we looked for ways in which to get the users heavily involved in the design of their system. In our first project we recognized the value of significant user involvement and therefore planned for user secondment, including 90% of a senior person in the Registrar's Office and some time from representatives of all key departments. We also established a user Advisory Committee with senior representatives from all faculties. However, we soon discovered that maintaining sustained user support was not an easy task, because day-to-day activities frequently took priority over systems development. Thus we looked to additional solutions for Project 3.

Buying User Involvement

First, we "stole" an administrative staff member in the faculty of Education who served as our user trainer on Project 1 and hired her as a systems analyst. This has worked very well. The team has the benefit of an in-house user, while she has gained technical expertise and is better able to recognize when a proposed functional solution is not technically feasible. Next, we sought to ensure stronger support from faculty members. When one of our best faculty representatives, a former Associate Dean of Graduate Studies and a member of the Commerce faculty retired, we hired him as a team consultant on a part-time basis. He has an excellent

understanding of the administrative functions of the university as well as what will and will not be acceptable to faculty members in a student information system. His wealth of knowledge and sudden lack of day-to-day responsibilities allowed him to focus on the design of the system and therefore we improved the quality of the system significantly.

Another way in which we "bought" user expertise was by assembling a development team with strong application experience. In addition to the extensive student application knowledge for UBC team members, we hired consultants with student application experience, both at UBC and other educational institutions. In fact, when we take the two senior UBC people and the two senior consultants, we have a total of 47 years of diversified student application knowledge!

However, we learned that even with such knowledge it was not always best to assign analysts with strong functional experience in a particular area to that specific function. It was sometimes difficult for analysts to overcome their natural inclinations to improve efficiency by relying on their past experience rather than taking time to understand the needs of the current users. An alternative may be to assign another team member to do the initial research and design the system, then use the analyst's functional knowledge as a resource and for reviewing the design.

Structure for Participation

Strong, consistent user participation in the design of a system is difficult to achieve when using traditional approaches to systems development which rely on interview sessions with many individual users followed by extensive written specifications and user responses. We opted for a structure which required concentrated user participation for short periods of time. We did this by encouraging the use of prototypes and Joint Application Design (JAD) workshops.

We believe that using prototypes is the only way to design an effective system, since users typically don't know what they want in a system until they have seen a version of it. Further, in order to take full advantage of prototypes they must be presented and discussed with a group of users rather than with one person at a time. To be successful, such group sessions require a structure and a clear focus, which JAD delivers most effectively. Since it is a workshop with a team of users and only one analyst, a JAD generates excellent ideas and synergy while encouraging strong user participation. By incorporating the creative use of technology, such as projecting the prototype on a screen and modifying and expanding it during the session, users became even more actively involved in the system. However, this user involvement and improved quality of design did not come automatically. JADs and prototypes require careful management.

Prototypes, by their very nature, encourage change. Prior to the JAD we had to work with the team to encourage them to accept this change, since most analysts take great pride in their work and find it difficult to accept that their prototype wasn't perfect. However, after the initial JAD sessions, during which the users had changed the prototype many times, the team easily fell into the cycle of accepting and making changes readily. It was then difficult to bring the design to a close because there was always one more "better idea" to be incorporated.

Even the users got caught up in this "better idea" syndrome. For example, we established our general system design principles well before the JAD sessions, as we described earlier. We thought that we had considered all of the options and selected the ones which worked well in project 1 and were best suited to our users and our technical environment. Nevertheless, we still got surprised in some areas. Each of our screens had a unique mnemonic identifier. We thought these would be easy to remember and give some clue to where a screen fit in the overall system. During the JADs the users decided, however, that numbers with no specific meaning were a better way to identify screens. We were committed to designing for the users, so we agreed to use numbers on the new screens and to change the names to numbers on all of the screens already built in project 1!

In some cases the JADs encouraged creativity beyond reality. Based on previous experience with PC's, the users requested "friendly" menus. They had seen menus in alphabetical sequence, menus with highlighted key letters for selection, menus with selection by number, and menus with selection based on cursor positioning. Each of these approaches had its advantages for some group of users; therefore, they wanted some aspects from all four methods of selection incorporated into each menu! Needless to say, it fell to the project manager to explain why the technical limitations of MVS and the cost of programming would only permit one type of menu.

Offsetting our enthusiasm at the degree of attention the users were giving to design concepts in these JAD sessions was the disappointment at the consistency of the user participation. Even though we invited representatives from various departments to the JADs well in advance, we discovered that commitment to day-to-day activities appeared to take precedence over a system being developed for the future. Some people who had confirmed their attendance did not attend at all and others only attended for part of the session. Even more frustrating, we found that some users who were too busy to attend the initial three-day development session attended the one-day review session and then wanted to re-open previously resolved issues because they had missed the initial discussion. This presented a difficult dilemma for the JAD facilitator and the project manager who wanted the user involvement, but also had a tight project schedule to meet.

Finally, a few guidelines on selecting user representatives are in order. Because of the size of the University, we found that it was not feasible to involve representatives from every faculty and department in a JAD. Therefore, careful selection was required to get a representative cross-section of the campus. Sometimes, this involved including some users who had traditionally been opposed to the system. The natural inclination was to avoid these people, but we found that it was best to get their viewpoint up-front, when the issues could be addressed, rather than waiting for the sniping to occur after the system was installed. We also found that during the development process staffing changes occurred in key user positions. At UBC, Deans and Associate Deans are term positions. When the term for one of the Project's actively involved Associate Deans expired, his replacement had a totally different view of his role on the project and how the system should work. Managing such a change was a challenge for the project team.

Even more difficult, we discovered that our greatest asset could become a potential liability. Our Registrar has taken a keen interest in the project, has attended all of the JAD sessions, has displayed a great vision for the future and has shown that he has an extensive knowledge of the current rules and regulations. He has also been the champion of the novice and occasional user, suggesting various concepts which would make the system resemble a PC and be more accessible to these groups. His enthusiasm and vision had an infectious quality which the project team enjoyed. However, he sometimes forgot that the project budget was limited, the scope had to be controlled and that mainframe systems just couldn't deliver everything his PC could. We should all have such faith in systems development.

Recognize the Cost of Training & Documentation

Our past experience was probably not much different than most large projects in a decentralized setting. For Project 1 we organized and ran 35 user training sessions, which cost the project team more than 100 person days of effort. We trained over 300 staff and faculty and then handed out at least 400 user manuals. These manuals saw more than 200,000 pages of paper run through the Registrar's Office photocopier. The manual is already in its second edition and still needs revisions and improvements. Yet despite this massive effort, the team still spent more than 200 person days on post-implementation support, often "hand holding" the same users we had trained.

We concluded that by expending some resources early in the project to improve the user interface (as we have described) we hoped to reduce our training costs; but that was not enough. We also had to address the issue of voluminous specifications, which were read once or twice by the programmers and then left on the shelf, while someone else re-produced much of the same information later in the user manual. We decided to take an evolutionary approach, agreeing that in writing specifications we should have the ultimate goal of on-line help in

mind. The concept was to get the team to write specifications which could become documentation, which then would become the on-line help text. In this way we expected to produce a minimal user manual, perhaps in the form of a quick reference guide.

The theory sounded good and was eagerly embraced by the team; however, we made one startling discovery: not all analysts write at the same level or with the same degree of proficiency. We had agreed that screen help would consist of two parts. First, a brief statement of the purpose of the screen (what it did), which would be the first "page" of help. Second, there would be three to four "pages" of a description section indicating how the screen was to be used. It was amazing to discover that four analysts could all have a different definition of what the word "purpose" meant. In the first draft of our screen specifications we found that one analyst could describe a fairly complex screen in one terse sentence, while a colleague would take four convoluted paragraphs. Neither of these accurately described the purpose of the screen.

We also found that keeping a consistent level of language and approach was a problem. The programmers and analysts knew what a screen was supposed to do from the system point of view and were naturally inclined to write help for themselves. It proved very difficult to train analysts to think like clerks.

The answer, we found, was to have the team write the first draft of help and then let an experienced writer polish the product. This added to the time it took to develop the specifications but certainly improved the quality.

Conclusions

We are just completing the design of the system and have not yet begun programming and installation. We have tried to adhere to our definition of an effective user interface and to involve the users extensively in the design of their system. By this time next year we should have implemented the first phase of the system and gathered some working experience with it. Perhaps we will have an opportunity to share the outcome of this experiment with you at Cause 90.

**OFFICE OF SYSTEM AND COMPUTER SERVICES
IN-HOUSE MICRO COMPUTER REPAIR
IN THE COLLEGE COMPUTING ENVIRONMENT**

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Other than third party vendor maintenance services, what alternatives can College management consider for reducing the increasing costs of repairing and maintaining micro computing devices? What primary considerations should be addressed, when an alternative internal repair support decision is made? How do we ensure users will be provided service equal to or better than the service they would receive from third party vendors?

The In-house Micro Repair Group at Cuyahoga Community College was initiated through a proposal developed by the College, the Office of Systems and Computer Services, and Systems & Computer Technology Corporation, the computing center facilities management organization.

INTRODUCTION

Cuyahoga Community College has implemented an in-house "Micro Computer Repair Center" which provides faster response to user problems, is more sensitive to user needs and priorities, and is more cost-effective than third party services.

This session will share the experience Cuyahoga Community College encountered before, during and after the implementation of it's own in-house Micro Repair Center ...what went right, what went wrong,.... and is intended to provide background or assistance to other Colleges in implementing similar in-house solutions.

BACKGROUND

In 1983/84 Cuyahoga Community College was faced with the dilemma of whether or not to continue paying a third party vendor approximately \$95,000 annually for the maintenance of its terminals, printers, and micro related devices, (approximately 622 pieces of equipment), or find an alternative which would be less expensive, provide faster response and better service user support requirements.

During this period, whenever devices broke down or a user had a problem, a call was placed to the Office of System and Computer Services, (the data center), where it was logged by either a computer operator or a communications technician. The call was then forwarded to the third party maintenance vendor. They would respond by sending a repair technician to repair the device on site or return it to their service center. If a spare was required the college was still obligated to supply it.

Due to the critical nature of on-line administrative transactions being processed, it is imperative that terminal problems be addressed immediately. The vendor guaranteed four hour response time, which is not unreasonable without a dedicated repair person on site. Quite often, this response time is not sufficient. When lines form at the business office, during registration because of equipment downtime, students get angry, frustrated and leave. When you depend on enrollment for your livelihood, this type of situation can not be tolerated.

The College data processing environment at this time consisted of a Honeywell 6610 dual processor as the mainframe computer linked to three campuses through Honeywell DPS 6's serving as gateways. All Administrative Offices had Hazeltine or Courier terminals which were the smart devices and Lear Siegler ADM 3/5 dumb terminals. Remote printing was primarily done utilizing Decwriter LA 34/36 printers. The Micro computer environment consisted of a few IBM PC's in some offices, Apple II's in labs, and some donated Commodore 64's, none of which were network connected. Computer related hardware and software inventory management was in its infancy, unorganized and inefficient.

Gameplan

Planning was underway for upgrading the current network terminals to micro computer PC's which would provide faster response and greater functionality for the users. Implementing leading-edge technology, the college was creating more micro computer related courses of instruction, which meant more micro computers in the classrooms, which required more dollars for maintenance. All things considered, it became apparent that micro repair costs were going to significantly escalate.

After requirement bids, five vendors submitted proposals for the maintenance of the devices just described. Only two vendors quoted prices for the repair/maintenance of all terminal, micro and related devices, one being the then current college third party maintenance vendor.

TRANSITION

A proposal was prepared by OSCS and submitted for an in-house micro repair center utilizing existing communications support personnel.

The college decided to try experimenting with several options. The first option tried was an agreement with the third party vendor on a time and materials basis, with no overall maintenance contract, for basic equipment repair services.

The second option also included the third party vendor on time and material, but also included one of the college OSCS communications technicians as an in-house repair person. The vendor was primarily responsible for the repair of the administrative terminals and remote printers. The OSCS technician was responsible for repair calls associated with micro computers, ensuring that all calls were logged and forwarded to the vendor and tracked if local repair was not possible.

The vendor charged \$60.00 per hour with a two hour minimum so all calls cost at least \$120.00... more than the worth of some devices, after parts costs were added.

The technician was soon overwhelmed with repairs and faced a backlog of equipment, which had been picked-up for repair. The backlog continued to grow and consequently the single technician with his other communications responsibilities, couldn't service the devices disabled the longest. This arrangement was unsatisfactory because the technician could not perform his primary duties which took priority over repairing micro equipment or auxiliary devices.

OSCS Goes It Alone

Late in FY 87/88 the college decided to modify its contract with SCT and add an addendum for additional personnel to initiate its' own in-house micro repair center staffed by two repair technicians. The staff currently consists of a senior technician, repair technician, and part-time student assistants on a contingency basis supervised by an OSCS Manager.

The guidelines for the Micro Repair Center were that it would provide four hour response time, provide coverage from 7:30 A.M. to 9:00 P.M. (Monday through Friday) and service all three campuses, the District office, and other satellite sites which the college owned or occupied.

To begin operations, policies and procedures had to be written and implemented, the College community had to be informed of the existence of the Micro Repair Center and repairs had to begin.

The Micro Repair Center was budgeted with approximately \$115,00.00 to buy replacement parts, loaner devices, tools, manuals, a software package

for inventory and problem history management, and pay third party vendors for any work allocated to them. Initial staffing costs were budgeted at approximately \$163,00.00.

The initial Micro Repair Center staff consisted of a senior technician who had an extensive background in micro computers, a trainee who was transferred from computer operations, a student assistant with a knowledge of micro software, all under an OSCS Manager with an operations background.

The first order of business was to prepare a suitable workplace. A phone number exclusively for micro repair had to be obtained and published. Space had to be allocated and work areas set-up. Space for parts, tools, manuals, in-coming/out-going devices, devices waiting for parts, others being worked on and office space was another concern which had to be addressed; there had to be space for not only the computers, but also for the micro repair staff.

A form had to be designed which would serve as hard copy documentation of problem calls. Information had to be comprehensive enough to include the requestor name, phone number, problem description, date/time reported, date/time responded, date/time device up, repair person, description of work performed, time spent, parts cost, warranty information, loaner information, and name/date/time of outside vendor. This all didn't happen on the first design...the form became more descriptive as more experience was gained in the shop. Also this hard copy form had to stay with a device until it was returned to the user. This repair form is also the vehicle used to log and monitor problem history which is maintained on the Micro Resource Manager software package.*

Resource Management

At this point it's appropriate to discuss the importance of having an automated software package for inventory management and problem history tracking.

The college had established a policy which required all hardware/software purchased by anyone in the college to be logged, tagged, and distributed by the data center. This provided a control point which allowed better tracking of the increasing amount of micro computer equipment. Prior to the establishment of the Micro Repair Center all of this information was entered on a data base maintained separately within the data center. The college also maintains its own data base which contains the same information, but not as organized or descriptive. Neither of these data bases contained files which could be used for problem reporting or maintenance information; especially labor and parts cost data.

Management reporting requirements at this point were vague and undefined. The initial focus was on inventory control management and problem history. The first tracking package purchased cost \$600.00 and after installation and use for a short period of time was found to be deficient in tracking labor or parts costs and wasn't sophisticated enough for our expanding inventory management requirements. We reviewed the Micro Repair Manager (MRM) package from Atrium Information Group which appeared to fulfill our requirements and could be upgraded to accommodate 15 on-line users. We purchased the basic package in November, 1988 but production installation wasn't implemented until March, 1989 after an initial testing phase. Computer Associates now markets the MRM system. Management now focused on inventory control, problem history, labor tracking and parts costs statistics because OSGS had until July, 1989 to present facts figures, and statistics which would justify the decision to continue the implementation of the in-house Micro Repair Center.

To install the MRM inventory data base we had to import all records first from the original package base and second from the college capital data base. The first import was not difficult because previously defined files and descriptions were similar. We completed importing records from the college capital data base, (the most difficult) in October of this year. It's important to note that on the data base a device is defined as anything which is attached to, can be attached to, or actually is a micro computer. For example, a keyboard is a device which we must fix or discard, but still have the responsibility for repairing it...even though keyboards aren't

entered on the data base because they cost less than \$200.00. We still have to provide parts and labor costs for repairing them.

In-house repair becomes a necessary and viable alternative when the number of devices begins to exceed 600. This is an approximate break even point, depending on equipment repair supported, to cover salaries, parts and equipment. Currently CCC with 2,000 micros representing a composite total of 8,000 devices to support, requires a cost effective solution. Our present in-house repair cost to support all equipment, PC's and other devices, is \$278,000 per fiscal year. A current third party vendor quote received, of \$246.00 per PC, would equal \$492,000 for just PC's alone. Consequently in-house repair saves the College a minimum of \$200,000 per year. To realistically look at total savings, you must include the cost of third party repair for all other non-PC devices. The additional costs of these items, digitizers, plotters, file servers, printers, etc. dramatically escalates third party maintenance costs over just PC support.

Estimated savings since the original implementation of the in-house Micro Repair Center at Cuyahoga Community College approaches \$392,300 for 22 months of service. This figure is based on prices third party vendors have quoted to maintain devices at one college location... then multiplied by the remaining devices throughout the rest of the college and compared to the documented costs we have incurred in the Micro Repair Center.

An alternative method of comparing internal versus third party is to take OSCS's labor charge of \$35.00 per hour and compare that to the minimum hourly rate third party vendors would have charged for the same repairs on site; approximately \$130.00 and then add the parts costs. Most third party vendors are quoting \$55.00 per hour on-site but they also include travel time and expenses in addition to this cost which equals the \$130.00 figure. We realize significant savings (wholesale) on Apple parts as an authorized Apple repair center. This is achieved by having a repair technician trained at their school.

FUTURE CONSIDERATIONS

Currently the Micro Repair staff is resident at the Metro Campus of the college. While this arrangement provides timely service to Metro, the District office, the Unified Technology Center, and a downtown satellite it doesn't provide the same to the two campuses located outside the Metro Cleveland area.

We have considered several alternatives to improve micro repair. One alternative is providing training, at a basic level, to Academic Campus Consultants located at our Western and Eastern Campuses and providing a small inventory of devices and parts frequently causing problems at these sites. At this point in time this alternative is still under consideration. Ideally, there should be a qualified repair technician at each campus who is linked online into the MRM system. This would allow us to generate an action report from the MRM system directly to the appropriate campus and that technician could then perform the required maintenance and update the MRM system. If the repair call required us to bring the device to our central shop at Metro it could be picked up and a loaner dropped off by a delivery person making the rounds to all locations once a day.

We also need to improve our service/response from those third party vendors which are repairing farmed out devices. Some of these repairs are taking in excess of two months which is unsatisfactory. Expanding our repair capabilities to reduce the necessity of sending equipment out appears to be the only realistic solution to this problem.

We have requested the programming staff to perform an analysis of the "MRM" and "Progress" software packages and to determine from management what reports or reporting statistics are required. The analysis will be the impetus to generate a project producing additional custom reports from these two packages.

The use of College student assistants could also be expanded into an academic training environment supported by and supporting the institution.

The management of the inventory database can be greatly enhanced by including the Purchasing and Receiving departments in the group of online users of the MRM system. This would allow any purchase order relative to micro hardware/software to be entered by the Purchasing department at its inception, viewed for status by our office, updated by the Receiving department when the order came in, and updated again by our department when the order has been tagged, delivered and installed, and finally entered into the inventory database by our staff.

CONCLUSIONS and RECOMMENDATIONS

The in-house Micro Repair Center at Cuyahoga Community College is a new viable operational entity which has saved the college hundreds of thousands of dollars in its 22 months of operation. It provides faster response to user problems than a third party vendor can for the costs incurred, and it provides the college user community a central point within the college which they can call for hardware problems. An additional benefit of the in-house Micro Repair Center is the familiarity and in most cases a relationship the users have developed with the Micro Repair staff in addressing their questions and problems. Having a central focal point within the college which monitors the pulse of micro related problems and micro inventory management is essential for control purposes and for senior college management to be able to identify its' micro computer resources and micro computer needs.

Distributing Support - Departmental Computing Coordinators

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Abstract: End user computing appears to be successful as the talents of end users are increasing. This is the mission of our information centers. The mission is being fulfilled, and everyone is happy, right? Well, almost, but now we face a new set of concerns as decentralized processing seems to threaten the integrity of the institution's information resource.

Information Systems at Loyola is sponsoring a new program to create a partnership and better define the relationship between it and end users. The program will institute an accountability called Departmental Computing Coordinator (DCC). The objectives of the program are to promote and harness the talents of end users, while maintaining the integrity of centralized systems.

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To say that a lot has changed in computing over the last few years is not an unusual statement: computing always changes a lot *any* and *every* few years. What distinguishes *these* last few years are the computing capabilities that have been placed on the user's desktop.

The new capabilities offer new opportunities, and computing support organizations have to reconsider their methods to take advantage of them. This paper describes how we at Loyola are doing that by means of a program called Departmental Computing Coordinators (DCC).

Background: Computing at Loyola University Chicago

Loyola is a private, Jesuit, coeducational university with an enrollment of about 16000 in its ten schools and colleges. There are three campuses in the Chicago area, and one in Rome.

Our computing environment is centrally administered, and standards for microcomputer hardware and software have been set by the Information Systems (IS) Division. Our mainframe computers are IBM. There are several DEC, HP and ATT minis, and about 2000 microcomputers - primarily IBM or compatible, with 100 or so Apples.

To date, the high level of centralization and standardization has produced a good track record: user satisfaction and IS credibility is relatively high.

IS has maintained communications with users through various committees as well as by establishing key contacts in each user department. In 1985, the key users representing the largest, or most computer intensive, departments were invited to join the IS sponsored "Superuser Group".

The Superuser Group is a voluntary collaboration between Information Center staff and Superusers. The group meets every two months. Coordination of the group was turned over to users after the first year, and IS continues to attend group meetings.

The Superuser Group is important because it sets the scene for the DCC program. We envision the evolution of our users as being key user to the more formalized role of Superuser, and then to the role of DCC.

Conditions leading to the creation of the DCC program

Before defining the DCC program, I would like to mention how we in IS saw things occurring at Loyola. I think that the following points also characterize most computing environments:

- There had been an increase in mission critical ("bet the business") systems operating on departmental microcomputers.
- There is an increasing demand by the institution to see return on computing investments i.e. how a department has improved their services or cut costs.
- There is an increasing requirement for specialized software. Loyola has met what the university had identified as a strategic level of workstation deployment, and the tools are in place that meet the need for basic automation - wordprocessing, spreadsheets, data management.

Departments are now requesting software for specialized applications - unique to the function of the department - in order to maximize the use of their computing equipment. The evaluation, selection and use of this software requires knowledge of the business of the department.

- There is need for administration of new areas:

Local Area Network administration - Loyola has 40 Local Area Networks installed, there are about 800 workstations connected via LANs. LANs need a certain level of administration performed locally.

Data administration - IS has been engaged in a Data Administration planning over the last 2 years. Of course, an important objective of data administration is to manage data to avoid redundancy and improve the integrity of data. Presently, however, there are over 150 end user managed databases in departments. Most of these were developed with IS; however, it is very easy to loose management control over end user databases. Therefore, IS needs to ensure that end users follow fundamental procedures in managing data in their databases.

- There is a desire to optimize the use of our expensive computing resources by taking advantage of computer literate users, of which there are many these days.
- Desktop computing capabilities will continue to increase, become less expensive and be available to a larger user audience.

Expected Benefits of setting up a DCC program

It was apparent to IS that our end user support methods would need to be upgraded to respond to the conditions just mentioned. For the Information Center, the primary end user support group, change was a familiar process. Prior change had usually meant an increase in central support staff, but since it was clear that user departments possessed a wealth of computing talent and capability, we had the opportunity to create a program that would take advantage of that resource.

This is what we hoped to achieve with a program that would give users defined roles as computing resources:

- A best of both worlds scenario: Successful computing projects require an institution-wide (integrated databases, telecommunications, network compatibility, data administration) and local (the function of the department) analysis. IS is the most qualified to address the former matters, the DCC is the most qualified to address the latter. Projects will be partnerships.
- The optimization of IS support through key department contacts
- The immediate availability of first line computing support to a department
- The synchronization of local computing planning with institution-wide, long range computing plans
- The creation of departmental computing standards to be maintained locally
- The improvement of IS/User communications
- The computing abilities of present staff will be utilized and redundancy in support services coverage will be reduced. The result should be a reduction in the rate of growth of the cost of end user computing support.

Departmental Computing Coordinator definition

The description of Departmental Computing Coordinator is called an "accountability".

An "accountability" is an individual component of a job description. Usually, a particular job description will contain several accountabilities, each of which is assigned a percentage of time and a rating of the impact of the performance of that component on the institution.

DCC was set up as an accountability, rather than as a job description in itself, to accommodate different percentages of time required to fulfill the DCC responsibilities according to department size and level of automation. For example, in some small departments the DCC responsibilities can be fulfilled using a small percentage of one staff

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member's time, while a large department might require that a full time staff member be dedicated as a DCC.

The same flexibility is required in regard to rating the impact of the DCC responsibility. For example, a DCC who is responsible for workstations serving a patient monitoring function will receive a higher rating for impact than a DCC who is responsible for wordprocessing workstations.

Any DCC has the responsibility to be a liaison between IS and the DCC's department. This entails:

- Serving as the communication link between IS and the department.

Communicates policies, standards and procedures to department staff
Communicates user needs to IS

- Serving as the first contact for his/her department's computing questions.

In addition to the liaison role, a DCC might have either, or both, of these functions:

- **Administration of departmental LANs**

At least one individual must be designated network administrator for a Local Area Network installed at Loyola. This person will be the department's liaison with Information Services and will be expected to fulfill the following roles and responsibilities:

- Planning, with IS
- Set-up and installation assistance
- Support for day to day operations
- Training requirements coordination

- **Departmental Data Administration**

At least one individual must be designated data administrator if the department locally maintains electronic data owned by the institution (Data Administration will be the arbiter, if necessary). This person will be the department's liaison with the Data Administrator and will be expected to fulfill the following roles and responsibilities:

- Planning, with IS
- Programming (Fourth Generation Languages)
- Documentation of data management systems
- Data backup and recovery
- Staff training requirements coordination

How does a department determine if it needs a DCC?

IS presently handles most of the computing functions that have been described as future responsibilities of DCCs. In many cases IS will continue to do so. The need for a DCC arises when departmentally directed computing becomes an operating requirement. The following are guidelines for when DCC functions should be instituted:

Liaison - As mentioned previously, all DCCs will have, at least, liaison responsibilities. This role is recommended when a department's computing requirements would best be met by identifying a key, local user. This recommendation would typically be made by consensus of the department head and IS.

LAN Administrator - This DCC function is required if the department has a LAN.

Data Administrator - This DCC function is required if the department locally maintains electronic data which Data Administration classifies as mission-critical data. The role might be recommended if the volume of data maintained locally is large, even though the data are not considered to be mission-critical.

Once the need for a DCC is determined, how is it instituted?

After IS and a department head have concluded that a DCC is needed, the department head will have the DCC accountability included in a revision of the job description of the employee selected to serve as DCC.

The revised job description will be submitted to Compensation to review for possible regrading of the position.

Pitfalls to date

Overall, the DCC program proposal has been well received. Serious pitfalls have not been encountered. The following are questions and constructive criticisms directed toward the DCC proposal:

1. The *More Work* criticism is, "How come we have to make this a formal program, and go through the trouble of regrading jobs?"

The response is that we have gone as far as we can go informally, and the need for DCCs is increasing greatly. The Superuser group has taken responsibilities on voluntarily; however there is no guarantee that this will be true for most users. These responsibilities are not an official part of the job, and are not included in compensation consideration. So far it has been a matter of great cooperation and luck.

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2. The *Not Manageable* criticism is, "We have over 250 departments! Where are you going to hold meetings?"

The response is that although it is possible for the number of DCC's to grow to where monthly meetings become unwieldy, we'll manage communications with the DCCs through technology (electronic and voice mail), newsletters and small meetings which IS will repeat.

3. The *How to Evaluate Positions* question is, "What do we do when one Secretary Grade II has the DCC accountability and another Secretary Grade II does not?"

The response is, from our Compensation Department, that this is not a problem. It is a matter similar to many others, such as when one secretary monitors a budget of one million dollars and the other secretary does not monitor budgets at all, or perhaps monitors a very small budget. The difference in percentage of time spent and in impact will be graded accordingly.

4. The *Who will be the Gatekeeper* question is, "Who will decide who needs and who shall be a DCC? Won't this have implications like faculty asking for a reduced teaching load because they are the DCC?"

This is pending resolution. The resolution will probably have the department head request of the head of his/her division that a staff member become a DCC. This request would include a written recommendation by IS and a justification according to a formula.

5. The *Costs* question is, "Will it cost a lot to upgrade present positions by including the DCC accountability in job descriptions?"

The response is that overall costs for computing support will be reduced institution-wide, although DCCs are likely to receive a small increase in pay. Cost savings will result from a reduction in the rate of growth of IS end user support staff.

Progress to date

We are optimistic about the development of and response to the program so far. Support for the DCC program has been received from these sources:

Information Systems sees the program as a means to support the IS mission, which is:

"To provide the leadership and expertise to design, implement, support and manage information technologies to foster the teaching, research, and health care mission of Loyola University Chicago"

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Personnel and Compensation like the program because it will establish job grading standards to use for the increasing number of positions which include computing responsibilities.

Superusers like the program because it will provide a means to have their responsibilities included in their job description, and therefore to be acknowledged and paid for performing those responsibilities.

Most Department Heads who are acquainted with the program support it, and a few have not formed an opinion. Those who like it feel that it gives them greater influence in their department's computing operations.

The program has received a qualified sanction by the Information Systems Steering Committee, pending resolution of the "Gatekeeper" question (#4 above). This committee consists of Division Heads.

Other signs of progress are that:

- many of the elements of the program are in practice, or are being put in practice. This can also be a pitfall (see #1 above) if it is perceived that there is no reason to pay someone who is presently doing the job voluntarily.
- the DCC manual has been written.
- important issues have been raised, some have been resolved, and the rapport between IS and departments is continually improving.

Summary

The Departmental Computing Coordinator program will:

- clarify the computing responsibilities of department staff.
- clarify the departmental computing support responsibilities of Information Systems.
- optimize computing talent within the institution.
- reduce the cost of end user support services.
- contribute to Data Administration objectives.
- establish a better rapport between Information Systems and our user community.

Conclusion

Loyola's centralized approach to information technology management has been successful. However, technology has changed. Implicit in the DCC proposal is the recognition that Loyola's mission, and therefore the IS mission, can be better served by reassigning responsibilities for *some* areas of end user computing that IS previously controlled. This will encourage creative application of computing technology to specific department business problems, and free IS resources to concentrate on the enhancement of the information technology infrastructure.

There is a certain amount of risk that is involved when reassigning responsibilities. The DCC program is a cooperative effort between IS and our users, based on mutual respect, and ultimately, mutual goals. The maturity of the Loyola IS organization and user community have created the confidence that any failures will be outweighed by the overall achievements of the program. With many elements of the program currently in effect, this has so far been the case. We are optimistic that the DCC program will be officially sanctioned in the near future, and that it will meet its intended goals.

EGADS, we DID it!

Employing Global Administrative Distribution Strategies Data Integrity Distributed

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The University's demand for access to data makes it necessary to distribute administrative systems. Global strategies fundamental to the implementation of distributed systems are: source point data capture, electronic signature approval process, data value authorization restriction and access to administrative systems by all departments. These strategies widely disperse the responsibility for data integrity to user offices. The recent design and implementation of the new Student Records System at Virginia Tech employ these strategies. This discussion will explain these strategies, their impact on the development and distribution of administrative systems, the advantages and disadvantages of distribution, as well as user interaction in development.

Introduction

A totally distributed system is one which provides all users access to data they need while prohibiting access to data they are not authorized to see. This access includes both inquiry and update capabilities. The demand for increased access to data at Virginia Tech necessitates the distribution of all new administrative computer systems. Adoption of distribution philosophies and implementation of the supporting strategies provides the methodology for accomplishing this. The rewrite of the Virginia Tech Student Records System combined these philosophies and strategies with extensive user interaction to produce a distributed system. Academic departments maintain data integrity which results in the role of data verification for the central student records office.

The Systems Development group at Virginia Tech is the primary developer of new administrative systems for the on-line IMS environment. This paper reviews the early development procedure at Virginia Tech, the philosophies and strategies that changed our methods, a system developed employing these strategies, and the conclusions resulting from an actual implementation.

Early Development

Development in the 1970's was initiated by a request from a user office, then fundamental manual procedures of the user office were observed and their basic needs were considered. The users were only involved in minor decisions during the design phase of a system. All other development phases of the project were strictly controlled by Systems Development, from planning functions and designing screens to testing the system. The user office was consulted on the contents of the screens but rarely saw them again until the system was demonstrated prior to implementation when they were trained and presented documentation defining the use of the system.

Systems Development maintained these early systems until growth in expertise and staff led to the formation of system support groups associated with large user areas, such as Personnel/Payroll, Student Records, and Student Accounts. These groups then became responsible for system maintenance, minor modifications and user reports as requested.

Access to transactions/functions was controlled with logical terminal security. Distribution was limited and generally confined to the related user area.

Over the years, the number of terminals on the main and satellite campuses expanded, until in the early 80's, all administrative departments had on-line access to the mainframe. The University community evolved into a sophisticated computer literate society with many of the departments active in mini and micro computing. This growth led to demands by deans and department heads for greater access and stricter control of information relating to their

areas of responsibility. Answering this challenge required a change in philosophies and strategies for developing new systems.

Philosophies and Strategies

Introducing new philosophies into the university environment requires a fundamental set of plans. In the 1982 CAUSE Monograph Series, Vinod Chachra and Robert C. Heterick presented a global strategy for administrative systems in a document entitled *Computing in Higher Education: A Planning Perspective for Administrators*. This publication contained the following concepts.

- **Source Point Data Capture** - Data is entered via workstations in the department of origin and transferred electronically to the destination office. Any requirements for approval at a higher level reroutes the document through the appropriate office for an "electronic signature".
- **Value-added Data Handling** - The data's electronic route depends upon a user's need to add information or approve a document. For those administrators not in the hierarchical flow from source to target office, on-line queries and management reports are available.
- **Destination-Point Documentation Generation** - Documents are printed in the destination office as needed for external communication and verification.
- **Transaction Tracking System** - Events are tracked in audit trail records with individuals restricted to activities and data corresponding to their area of responsibility.

The University adopted these global strategies for administrative systems and approved the "electronic signature" - the concept of a password entered on a terminal screen in lieu of a signature on a document. Implementation depended on an authorization system capable of identifying areas of responsibility for a user and the required routing flow for documents.

Virginia Tech Authorization System

The in-house developed Virginia Tech Authorization System controls the use of IMS transactions through a unique authorization identifier associated with a user. These are established by Data Administration on request from an administrative user. The authorized user then contacts the administrative office controlling the requested transaction for access. Transactions are grouped according to function with access based on the need for the function. The administrative office is responsible for distributing the functions and assigning the data value mask for the user.

The data value mask defines the type of authorization and how a function is distributed. For example, the data value for the grade change function is composed of college, division, department, and course level (undergraduate

or graduate). Each person's mask for this function is based on their level within a college. The dean of the College of Education can process any student taking a course within the college. The associate dean of a division within the college can process any student taking a course within his division. This hierarchy continues down through the department head and his/her assistants responsible for undergraduate and graduate courses. The mask for the Registrar's staff is set to allow access to all students.

The routing of data through the various offices is controlled with the data value mask and a process called "in-basket". Approval hierarchies are established for functions based on signature requirements. In the approval process of an electronic document, routing automatically progresses to the next level upon approval at a lower level. The user at each level reviews the documents to be approved in his/her electronic in-basket daily, much the same as processing paper documents. Alternate signatures are defined for each level to expedite the flow regardless of absenteeism in the signature hierarchy. An audit trail of the signatures, the original document, and any comments added during the approval process are stored as part of the authorization system. On final approval, the new information becomes effective with the update of the appropriate administrative data base.

To hold users accountable for changes in a system, the authorization identifier and password are required on all update transactions. These become part of the audit trail reflecting the change. Thus accountability of data is based on the authorization identifier and the access controlled with data valued functions.

Distributed Student Records System

In the summer of 1985, the University administration announced the decision to convert from a quarter calendar system to a semester calendar system beginning Fall 1988. The existing student records system was first developed in the early 1970's and was supplemented with additional data bases throughout the next 15 years. Structural changes were needed based on requests accumulated over the years in addition to those required for the semester conversion. Rather than make major modifications to an antiquated system, the University requested Systems Development rewrite the entire student records system employing the policies and strategies previously described.

Objectives

System objectives, based on the global development strategies, were:

- Build upon the computer literacy of the University allowing users to fully interact with the system
- Capture data at the source
- Provide accountability in conjunction with data access

- Reduce flow of paper to and from the Registrar's office
- Utilize electronic signature approval process for documents
- Involve user in every phase of development

Other objectives of the rewrite focused on paper storage reduction and system modularization for ease of maintenance.

User involvement

Due to the extensive scope of the rewrite, it was divided into multiple sub-systems based on publishing and processing deadlines. Meetings with the University Registrar and staff to define the basic functions began the development of each component sub-system. A set agenda defined topic guidelines for each discussion and members of the Registrar's staff attended those pertaining to their individual areas of responsibility.

General sessions were held with the undergraduate and graduate academic deans, department heads, administrative users of student information and the Office of Institutional Research to gather their requirements for the new system. These sessions were more comprehensive allowing for discussion of existing problem areas and requests for processing, access and data. Transfer of responsibilities for data entry and data integrity from the Registrar's office to the colleges and departments was explained and discussed. Current procedures and information flows in the various colleges were analyzed to arrive at consolidated solutions acceptable to all concerned. Meeting documentation, recorded by a secretary as well as the analysts in attendance, provided a valuable cross reference during the system design.

Planning meetings were held with Student Systems Computer Services, the computer support office for all student related functions. Issues discussed included maintenance requirements, reporting needs, good and bad features of the existing system, and areas needing expansion.

As design analysis was completed for each phase, a detailed scope of effort proposal was presented to student system administrators for approval. Once these proposals were approved, data bases were designed and, as part of Systems Development's methodology, reviewed by in-house data base committees composed of selected members of Systems Development, Data Administration, and Student Systems Computer Services. Screens and reports were designed with the Registrar retaining final approval of all layouts. Throughout the entire rewrite, an analyst from Student Systems Computer Services was assigned as a liaison for the communication of requests and responses between the Registrar's office, Student Systems, and the development team.

The Registrar's staff was involved in the system testing phase of each sub-system. Also, selected academic and administrative departments across the campus became test sites. Their expertise in daily processing identified ex-

ception conditions in several procedures and their perspective on the flow of screens and transfer of information from one sub-system to another resulted in modifications which improved overall system performance.

Before implementation, the Registrar's office was responsible for determining the distribution of transactions to academic and administrative departments and colleges. The needs and requirements for data accessibility for each office were reviewed to establish the proper data value mask for each function.

Training

Prior to this system, a minimal number of transactions were authorized for departmental users. Because of the wide distribution of update capability, greater emphasis was placed on training for this system. To enhance this training, detailed user's guides were produced and distributed at training sessions.

As previously mentioned, the University Registrar's staff was trained in conjunction with sub-system testing. A diverse cross section of the University community, ranging from clerical staff to college deans, participated in group training sessions corresponding to their access needs. These were conducted in the weeks prior to implementation and attendance was mandatory to receive authorization access to the new system. Slides were used to explain each transaction and familiarize the users with the type of information available. A question and answer period followed each presentation.

After the system was put into production, the Registrar's staff conducted "hands on" training in each user's office, giving detailed explanations for each transaction defined for the user. Future users of the Student Records System must be trained by the Registrar's staff before authorization is granted.

Implementation and Results

The catalog sub-system was implemented in September 1986 to meet the publishing deadline for the Fall 1988 University Catalog. This was followed by the timetable sub-system in November 1987. The registration modules were temporarily placed in production in April 1988 to conduct class registration for Fall. The remainder of the system conversion took place in July 1988. An unforeseen benefit of phased implementation was the gradual introduction to the users of new transactions, processes and responsibilities.

In determining the electronic routing of a process, unnecessary steps in existing administrative procedures were uncovered. The review of manual procedures proved advantageous to the user offices and resulted in streamlined automated processes.

The new system provides the University community with:

- ***Increased access to information for inquiry and update throughout the University, restricted by area of responsibility.*** Deans are now able to view all information relating to students in their college as well as all courses taught in their college. Update functions, such as registration hours override, blocks, grade changes, classroom scheduling, etc., which were previously controlled by the Registrar, are now processed in the various administrative offices.
- ***Distributed responsibility for data integrity and timeliness.*** Grade changes are entered into the electronic "in-basket" by clerical staff upon request of the faculty member teaching the course. The course offering department head is the first step in the approval process. Grade change "documents" are then forwarded to the student's major dean with final approval granted by the course offering dean. At this point, the student's grade is changed with no required interaction by the Registrar's office. Additional process responsibilities transferred from the Registrar's office include demographic updates, major changes, academic level changes, readmission, independent study approval, and academic drops.
- ***Reduced paper processing and storage.*** Departments enter their Timetable of Classes modifications on-line where previously paper reports were corrected and returned to the Registrar's office for data entry. Grade change cards are no longer sent to the Registrar's office. All transcript information is now stored electronically, eliminating the need to store permanent record cards. Classroom usage is maintained on the system, replacing a manually updated room assignment board.
- ***Enforced policy by programmatic date and function restrictions.*** One module of the system, a Dates data base, contains all processing and calendar dates for each academic term. Schedule completion programs check this information before allowing modifications to a student's class schedule. Blocks are not allowed prior to the current date. Grade changes cannot be made before the current term is complete.

Function restrictions are in place to control student and course processing and are achieved with the data value mask. For example, Virginia Tech offers 4 types of degrees: associate, undergraduate, graduate, and professional. The Graduate School is only allowed to update student and course information pertaining to graduate students. Each college/department is restricted to their own data. This same concept controls access for on-campus versus off-campus processing.

Advantages

Accomplishing the major objectives for the Student Records System resulted in numerous advantages.

- **Entry of data at its source with immediate error detection.** This eliminates duplication of effort required when data is typed on a form prior to terminal entry. Errors in information are noted and the person responsible for the data can research and correct them.
- **Reduced errors from misreading or misinterpreting written information.** Interpretations of hand-written forms are no longer a problem for the Registrar's office reducing the time required to contact the user office for explanations.
- **Improved timeliness of processes.** The delay due to mail schedules and paper shuffling is eliminated. Changes can be processed in minutes rather than days.
- **Modified workload for the University Registrar's staff.** Other duties are accomplished because of reduced data entry, decreased form filing, and less time involved in researching errors.
- **Diminished volume of permanent paper records required.** All transcript information is stored in the system rather than on permanent record cards. Cards with the audit of grade changes and major/minor changes have been eliminated.
- **Enhanced control of data accessibility.** Distribution by function and access control by data value mask have resulted in more secure student records information.

Disadvantages

Post implementation studies and interviews revealed problems for consideration when changing to a distributed system.

- **Deans and department heads perceive additional workload for their areas.** These offices feel they are performing services previously provided by the Registrar's staff with no increase in resources. The system is viewed as function oriented rather than task oriented thus requiring multiple transactions to accomplish a single process.
- **A higher skill level is required for administrative users.** Correction of errors cannot be ignored and must be dealt with before proceeding with on-line transactions. Research into the cause of these errors requires knowledge in all areas of student records including the appropriate transactions for determining the cause of the error.

- *Verification for completeness and correctness has become more difficult with the removal of data entry from the Registrar's office.* Omissions and mistakes entered by the departments go undetected until they have an impact. For example, in the Timetable of Classes a subtitle for a course was published as "Ask John what to call this".
- *Restricted access is viewed as a limitation.* Deans cannot look at the records of a student in another college when considering a major change or readmission into a new major.
- *Additional computer hardware and communications expenses were incurred by some users to increase the access points to the IMS system.* Departments whose primary processing involved the use of personal computers required new and/or additional mainframe connections.

Conclusions

Final observations

With the support of the University, the Virginia Tech Student Records System was successfully implemented as a distributed system. Based upon a study by Virginia Tech's Administrative Systems Review Committee, the benefits of distribution to the user office and the University community are numerous and far outweigh disadvantages revealed since implementing the Student Records System project.

Establishing standards in processes across the various colleges will ease the impact of changes required by automation. The transfer of responsibilities from the central user office to academic administrators may require additional resources in those areas. Involvement of the user community in the development process needs to be encouraged to produce a workable system for all areas.

Distributing a data processing system requires the definition of policies and strategies to govern distribution of data, the full cooperation of the University administration, a means of controlling access, and the support of the user office.

Future considerations

All future development in the Student Records System will employ the philosophies and strategies discussed in this paper. Current discussions include the availability of data on PCs for spreadsheet processing and access to the system by students - not only for inquiries but to update items such as address and phone number. The capability of defining a user's access is crucial towards achieving the goal of total distribution.

Reference

Chachra, Vinod and Robert C. Heterick Computing In Higher Education: A Planning Perspective for Administrators, CAUSE Monograph Series, 1982

Administrative Systems Review Committee - Final Report, Virginia Polytechnic Institute and State University, June 21, 1989

The Center for Emerging Technologies in Computing, Communication, and Human Resources

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ABSTRACT

Converging technologies have dictated that institutions view their structure and use their personnel in new ways to manage the changing information and communication resource function. Today's information and communication problems demand answers which are integration oriented -- first for people, then for technologies.

A faculty/staff group developed a proposal for a needs-based, interest driven structure to achieve computing, communication, and human resources goals for the Institute of Agriculture and Natural Resources at the University of Nebraska-Lincoln. The Center for Emerging Technologies (CET), which could implement and integrate computing, communication, and human resources, is proposed to bring together people and technologies. CET offers a framework for solutions to these Institute-wide concerns:

- (a) computing/communication services;
- (b) staff updates, training and development;
- (c) student education concerning effective utilization of new technologies;
- (d) technology assessment, computing/communication research and development, and facility planning;
- (e) "think tank" applications providing a visioning framework.

The proposal for CET is on-going; we are not reporting on a completed project. We will describe the proposal presentation process and the audiences and outcomes. We will report on early returns on investment as well as some of the on-going, in process activities IANR is now undertaking.

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THE CENTER FOR EMERGING TECHNOLOGIES IN COMPUTING, COMMUNICATION, AND HUMAN RESOURCES

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Interactive, computer based communication technologies cannot solve all the problems of American higher education. Nevertheless, even in today's changing and seemingly chaotic educational environment, these tools advance both the practice and process of higher education (Sculley, 1989).

Many times, interactive, computer driven technology applications can be implemented within existing higher education structures. For structures to be successful, however, those responsible for administrative reorganization must be capable of change. They must see programs and themselves in new ways (Heterick, 1988; Hirschheim and Klein, 1989).

This paper focuses on one segment of a large, land-grant university, the Institute of Agriculture and Natural Resources (IANR) at University of Nebraska - Lincoln. We will discuss a planning effort to substantially expand the use of interactive technologies in our programs and attain more fully integrated applications across the campus. If implemented, this plan may require new computing and communication strategies, commitments to change, openness to risk, possibly new and untested management authority, and departmental reorganization within IANR.

We will describe the background of the institution, and some of the computing, communication, and human resource issues, the proposal outlining the Center for Emerging Technologies, and the outcomes of the entire process including the lessons learned.

THE BACKGROUND

The University of Nebraska has three campuses. The flag-ship campus, the University of Nebraska-Lincoln is a comprehensive, land-grant university with approximately 24,000 students. Redefined as a unit in 1973, the Institute of Agriculture and Natural Resources has as its mission teaching, research and extension in agriculture, natural resources and community and family living. It is administered by a vice chancellor. IANR provides state-wide support of agricultural needs through a network of research and extension centers and eighty county extension offices.

To handle IANR communication and computing needs, there is a Department of Agricultural Communications providing communication support, and the IANR Computing Services providing computing resources.

Historically, the Department of Agricultural Communications is responsible for developing brochures, editing manuscripts, producing slides and graphics, producing mediated programs, producing radio and television programming, and handling the IANR news and information functions. Computing services, including consulting, maintenance, and programming, are carried out through IANR Computing Services. Rigid boundaries exist. Once written, job descriptions are set in concrete. For each job and task, there are specific tools. Territory is defined.

A blurring of jobs and functions is now occurring. In Agricultural Communications, artists and editors are using computer graphics packages and desktop publishing systems. Reporters have developed a computer based electronic newsroom. In IANR Computing Resources and other departments, faculty and staff are developing brochures and newsletters using desktop publishing. Individuals are designing visual presentations with computer graphics systems. Across the campus, in every department and unit throughout IANR, faculty, staff, and students are using the same tool, the computer, for similar communication tasks.

Previously, each discipline had its own unique gadgets -- artists with rulers and colors, editors with blue pencils, reporters with paper and pencil, computer programmers with lines of code, statisticians with formulas. The tools were job specific. Today the same engine for the tools sits on the individual's desk, linked in varying configurations. The tools and the engines cross previously rigid boundaries. In fact, the tools and engines are converging. The technologies are evolving into dynamical systems.

Lines isolating "traditional" disciplines are becoming less and less distinct. We are all embracing similar, "front-end" technologies in our daily tasks. Yet faculty and staff are continuing to play old University roles. They perform traditional functions while assuming new, expanding roles with the tools of the computer/communication revolution.

We still have the needs for which the past tools worked well, and for which the new tools are continuing that work. We are doing timeworn activities differently, having computerized our former work tasks. By using computers, faculty are becoming more independent. Parallel to that developing autonomy, faculty are growing more dependent on the providers of new technologies, those individuals who know how to assess and maintain the new technologies, those individuals who can envision multiple and diverse uses of the new technologies, and those individuals who can work with the human component in the technological era.

These elements of computing, communication, and human resources are problematic. They do not fit into existing university patterns, with simple borders, within established and orthodox disciplines. Such novel constituents have blurred the traditional university structure. Naisbitt (1989) calls this the open square -- issues with no black and white, simple definition; rather they are issues full of grays, and reds, and blues, and perhaps many other of the 16.8 million colors.

THE PROPOSAL

As an outgrowth of an IANR faculty luncheon in September 1988, we came together as a group. That September meeting covered issues related to the decentralization and centralization of computing and communication services. From that discussion, we felt a need for the Institute to formally investigate new and emerging computing and communication technologies. We also wanted to include equipment and personnel recommendations to the Institute.

We firmly believed that decentralization of computing and communications technologies was resulting in the need for more powerful equipment and for connectivity between dispersed user groups. Decentralization was also creating an enormous demand for new University funds to explore and implement these technology explosions within IANR departmental units.

Based on our views of the future, we developed a short white paper. Our primary purpose was to suggest institutionalization of appropriate administrative guidelines to secure appropriations for items with price tags beyond the realm of individual departmental budgets. Such guidelines could include coordination of these activities by an Institute appointed Vice-Chancellor's committee. We sent our comments to the Vice Chancellor and selected department heads and were invited to meet with the Vice Chancellor's council, composed of all the Deans of the Colleges. Following that presentation we were asked and encouraged to further explore, expand, and report upon our ideas.

From this charge grew a second, more comprehensive proposal. This proposal encompassed the computing and communications, human resource, technology assessment, and futuring arenas at the Institute.

Our proposal rested on a simple belief derived from the literature, from our scanning of the environment, and our personal feelings -- that the information and communication challenges of today's campus demanded, and indeed, required, coordinated solutions -- first for people, then for technologies (Brand, 1987; Dede, 1989; Heterick, 1988; Hussey, 1985; LeDuc, 1989; Sculley, 1989, Seybold, 1989).

To fully implement computing, communication, and human resources, an organization must assume responsibility for identifying, developing, managing, and maintaining those resources. To define a framework for doing this, we proposed a **Center for Emerging Technologies in Computing, Communication, and Human Resources (CET)**.

Such a Center would facilitate the use of these resources within IANR. We proposed the CET to support institution strengthening and human capacity-building. We also recommended that CET results be evaluated in both human and technical terms.

What is The Center for Emerging Technologies? We envisioned CET as a needs-based, interest driven structure to achieve computing, communication, and human resources goals within the Institute of Agriculture and Natural Resources. CET is a formal response and an institutional commitment to the integration of people and technologies.

Steele (1989) pointed out that opportunity will rarely reside in the traditional practices of simplifying, separating, and operating exclusive entities. Integration will be the key since problems cross lines of interest and authority.

The Center for Emerging Technologies was proposed to address several Institute-wide needs including:

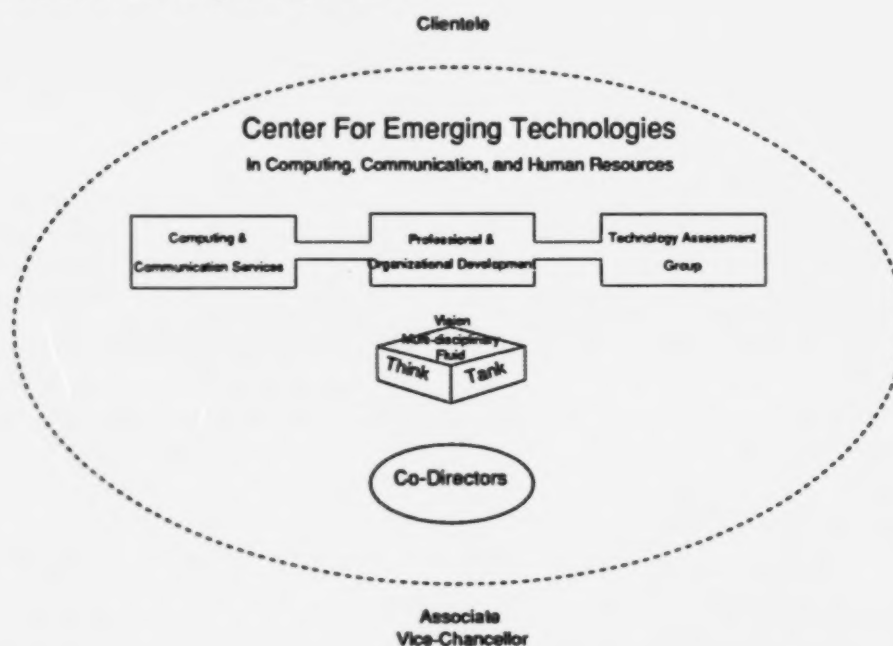
- (a) computing and communication services;
- (b) professional and organizational development focusing IANR staff and organizational development activities;
- (c) technology assessment, computing and communication research and development, and facility planning; and
- (d) "think tank" applications providing a framework for visioning.

The Center for Emerging Technologies in Computing, Communication, and Human Resources would create an environment that:

- refocuses efforts toward priorities as outlined in IANR's Strategic Plan;
- allows for doing new things, not just computerizing old processes;
- analyzes positive and negative impacts of the integration of technology and people;
- streamlines the support, consulting, and maintenance roles in IANR;
- allows for "think tank" capabilities;
- encourages curiosity and risk taking.

The CET would address perceived barriers and fortify multi-disciplinary ties between computing, communication, and human resources.

The CET structure flows from the functions of existing communication and computing programs and innovative *futuring* activities.



CET's four major areas or divisions are outlined and described below:

A. Computing and Communication Services--integration of computing, communication and information delivery services:

Computing consulting and support services would include administrative computing (budgeting, accounting, and requisitions, student records, drop and add, registration, research databases, and personnel), mainframe computer support, computer programming support, and computer labs (development, expansion, and monitoring).

CET communication services would comprise production of visuals, signs/displays, printing facilitation and distribution, photography. Consulting communicators would work on a inter- and multi-disciplinary basis within IANR to facilitate communication marketing, strategic planning, and production efforts.

Both communication and computing components would also involve maintenance capabilities, networking, equipment loan (computer and audio-visual equipment), large equipment facilitation (siting within units), communication and computer training and support on campus and at District Centers.

This component results from the integration of communication and information delivery services. A blurring of the barriers separating previous functions drives this natural marriage of services.

Computing, for example, was once separated between mainframe data processing (DP) shops and non-computer users. You either used computers through the DP shop, or you did not use them at all. This evolved into a mainframe environment which began supporting personal computer users only among the innovative. Today there are few, if any non-computer users on staff, most have access to intertwined networks, and none who particularly care whether the computer service represents a mainframe or personal computer operation. A blurring of the previously well defined confines of computing types vs. non-computing types has occurred.

Another good example of blurring can be found in the academic computing arena and alternatively the arena for administrative computing. In the very recent past, these two entities were quite separate. Many institutions, including the University of Nebraska, have distinct computing organizations for these two segments of our school's support components.

Today, however, a blurring of the barriers separating these entities is rapidly occurring. Review any issue of Academic Computing or T.H.E. Journal to see programmatic examples of vast blurring. Faculty are requiring access to their student advisees' records, electronic mail needs to travel over networks to administrators as well as educators, departmental accountants are accessing budgeting and requisitioning programs via campus networks, and yet they still expect electronic access to all the academic programs and academic computer networks. The list of mutual needs is growing daily. Now, instead of being able to conduct business within a DP shop, or across a proprietary network, the

academic and administrative information organizations are utilizing similar network components, as they're now being required to serve identical user bases distributed across the campuses. This blurring of boundaries is requiring the movement to similar computing platforms or transparent information exchange between varieties of vendor platforms.

Distributed computing has fostered the growth of local desktop publishing, newsletter productions, graphic design operations, and the use of multi-media technologies throughout many campus departments. Where once the department of information or communication was relied upon for nearly all production and dissemination of materials, more and more production is being done "in-house". Questions to our communications specialists from faculty and staff are now highly technical, computer oriented and many times impatiently voiced. No longer are these professional communicators advising solely on content or appearance, but more on how to stretch the limits of the myriad of graphics and text hardware and software components springing up throughout the campus.

Secure, protective borders of responsibilities are disappearing. These two groups of service and educational professionals are finding themselves drawing from the same well and watering the same masses. The proposed component consisting of communications and computer services personnel, will enhance everyone's ability to serve more cooperatively and thus effectively.

B. Professional and Organizational Development - focus of IANR staff and organizational development activities:

The human component of CET includes activities revolving around faculty renewal, staff leaves, re-tread shop, staff training, student education and module development, grantsmanship, fundraising, needs assessments, interest inventories, development of recruitment and retention strategies, links to outstate educational facilities, research activity such as impacts of change, higher education, administration, etc.

Professional and Organization Development activities will cut across many of the Computing and Communication practices. Both groups will have to be closely coordinated to ensure targeted, specific programs for faculty, staff, and students.

C. Technology Assessment - facilitation of the research, development and evaluation of new computing and communications technologies:

This component would be responsible for the development of the Institute as a Beta and pilot test site for emerging computing and communication technologies. It would also work on planning functions for IANR computing and communication resources, such as consultation on new buildings, student computing labs, and networking.

Other activities would include outreach to Nebraska industries and business on computing and communication consultation, and research on communication activities and outcomes, including qualitative audience analysis.

D. Think Tank - framework for visioning and futuring:

This component is a future oriented, scanning group that encourages new ideas. Activities will focus on establishing environments for planning, modeling, and prototyping ideas, analyzing positive and negative impacts of suggesting ideas via cross impact matrix analysis, and creating a body of resource materials for sharing.

Interaction will take place in interdisciplinary and multidisciplinary ways and would allow individuals from differing views and/or areas to combine positive talents. Thus, we feel that human capacity for problem solving and futuring will be developed, refined, and enlarged through the think tank and the human resource component. The Think Tank is to provide the environment for *alignment* (Naisbitt and Aburdene, 1985).

On coming into the think tank, people's initial expectations will be "challenged/reset"; people will have or be exposed to some fundamental training in futuring before they come into the think tank. Follow-up activities will be developed as part of the experience. A process of constant futuring will be developed.

An attempt will be made to avoid elitism or the charge of snobbery. The think tank should not divide people into categories. Rather it should be used to bring people together. However, it is not a counseling center for opposing views. It is a process oriented, futuring activity. The think tank encourages responsibility for thinking. It invites moving information around and depends on open environments, minimum boundaries, and high levels of people interest.

A lot of think tank activities will take place away from normal duties and environments, i.e., retreat type of settings. Yet a lot of activities can be done in the current physical environment. The challenge will be to change the mental environment of faculty, staff, and students. Initial training and challenging of expectations will be used to change that mental environment. New norms will be established when people come into the think tank.

EXPECTED IMPACTS

What are the expected impacts of the CET? Based on our examination of the IANR needs and expectations, CET objectives and activities, the following impacts were projected:

1. Addresses the organizational challenges of IANR Computing Services and the Department of Agricultural Communications. It brings together the emerging technologies and the support staff of computing and communication.
2. Places responsibility for the management of support services with professional/managerial staff, and not faculty. This arrangement would free faculty for consulting and academic activities supporting CET.

3. Focuses on human resource needs in response to accelerating changes.
4. Provides a structure for "re-careering" and "opportunity offering" through the Professional and Organizational Development component.
5. Eliminates duplication of services.
6. Provides structure for multi-disciplinary interaction between CET and departments in content related development activities.
7. Eliminates the encounter between centralization and decentralization service concepts by advocating that a mix of both is a more realistic approach.
8. Recognizes the need for strong, distinct authority in content areas of computing, communication, and human resources for the purpose of institutional structure and functions of leadership, development, and futuring.
9. Creates temporary disequilibrium among those directly impacted by proposed changes, an addressable administrative impact.
10. Creates unit administrative issues including transfer of personnel and services, and tenure concerns.

OUTCOMES

The CET is an idea whose time has not yet come to IANR. Nevertheless, the changes envisioned in the CET and its proposed restructuring remain viable.

We know that order, rationality, predictability, and impersonal modes of operating are all barriers to innovation and creativity in institutions of higher education. Change, of the scale offered by the CET proposal, runs counter to institutional needs of orderliness and predictability. While it can be planned and controlled, change requires new behaviors, different interactions, altered assumptions, and revised attitudes.

Given that, several ideas from the CET proposal and the earlier White Paper have been explored and implemented. These include the following:

1. Administrative calls for new equipment requests and acquisitions have been prioritized based upon IANR-wide, interdisciplinary utilization.
2. The Office of Professional and Organizational Development (OPOD) was in the process of independent formulation during this proposal's development. OPOD is now undertaking human resource activities encompassing recareering, technical assistance, and retraining.
3. Several IANR task forces have been formed campus-wide to review and forecast policy on databases, graphics, and desktop publishing activities.
4. Think Tank applications have been reconceptualized to include futuring. One member of our group has been asked to work in multi-disciplinary, Institute futuring activities.

5. An informal IANR-wide futures group of faculty and staff is meeting on a regular basis, twice a month. In addition, the Department of Agricultural Communications has developed a futures committee.

Sikes, Schlesinger, and Seashore (1974) point out that all universities have obstacles to creativity and imagination. These involve order, rationality, predictability, and impersonal modes of operating. "Change to some degree runs counter to orderliness and predictability; it can be planned and controlled but inherently it calls for new behaviors, different interactions, altered assumptions, and revised attitudes. One cannot always be sure where it will lead" (p. 39).

We faced many of these obstacles to implementation and change. From our experiences, we learned several things, some of which we would like to share. For example:

1. *Don't take a hardball to a softball game.* We lacked experience in working with the system. We assumed that good ideas sold themselves. We did not include department heads or higher level administrators early enough in the design and development process. Basically, we handed them a "finished" product in the CET. We did not get an advocate to champion our cause. We mistakenly believed that administrative interest (which we had) was tantamount to strong support and quick implementation.

2. *Show me yours.* We had difficulty in assessing the reactions that others would have with the CET. The very nature of the CET makes it awkward to pilot or develop a prototype. Without a visible, working model, widespread faculty interest or serious administrative support has not been forthcoming.

3. *Wash your mouth.* We may have been too explicit when we wrote our second paper, the comprehensive opus detailing the CET. We played out our ideas and put our findings in writing, without options. We did not look for models or provide alternatives. We could have presented two or three scenarios representing different degrees of change.

4. *Don't expose your backside without suntan lotion.* While the administration was interested in our ideas, they did not officially sanction them. We should have asked for letters and verbal approval with copies to selected faculty, in particular the department heads.

5. *Share everything.* We did not involve key people on campus. Even though we used a multi-disciplinary team approach, we needed a broader base of support for systematic change, and for the development of the CET in particular.

We did not account for alignment. Once we had the vision, we needed to attract people who could help realize it (the vision) by adopting it as their own and sharing the responsibility for achieving it.

6. *Time is on my side.* We might have arranged time for people to spend studying the proposal. This might have helped broaden the process and understanding of the changes envisioned. Change could probably come about sooner and more radically if the administration had received the message from more people directly and indirectly affected by the

change. But we acted swiftly, turned data around quickly, and in the process, did not give many of the audience with whom we were communicating enough time to digest our ideas or offer suggestions.

CONCLUSION

We realize that success or failure of change ultimately rests with the people who are being asked to change - their attitudes, understandings and their support. This takes time. Although parts of the CET proposal have gained acceptance, and indeed have been implemented, others remain as *challenges*.

REFERENCES

- Brand, Stewart. The Media Lab. New York: Viking, 1987.
- Dede, Christopher. "Planning Guidelines for Emerging Instructional Technologies," Educational Technology, April 1989, pp. 7-12.
- Heterick Jr., Robert C. A Single System Image: An Information Systems Strategy. Professional Paper Series, #1. Boulder: CAUSE, 1988.
- Hirschheim, Rudy and Heinz K. Klein. "Four Paradigms of Information Systems Development," Communications of the ACM, October 1989, pp. 1199-1216.
- Hussey, G. Art. Electronic Technology: Impact on Extension Delivery Systems. Washington, D.C: Extension Service, United States Department of Agriculture, Electronic Technology Task Force Report, May 1985.
- LeDuc, Albert L. "Why Lightning Strikes systems Development-And How to Reduce the Probability," CAUSE/EFFECT, Summer, 1989, pp. 34-39, 53.
- Naisbitt, John. "Toward an 'Open Square' Society: Life in the Gray Area." Trend Letter, March 30, 1989. pp. 1-3.
- Naisbitt, John and Patricia Aburdene. Reinventing the Corporation. New York: Warner Books, 1985
- Sculley, John. "The Relationship Between Business and Higher Education: a Perspective on the 21st Century," Communications of the ACM, September 1989, pp. 1056-1061.
- Seybold, Jonathan. "Making Sense of the Computer Publishing Revolution," The Seybold Report on Desktop Publishing, September 20, 1989, pp. 3-7.
- Sikes, W. W., L. E. Schlesinger and C. N. Seashore. Renewing Higher Education from Within. San Francisco: Jossey-Bass, 1974.
- Steele, Ray. University of the Future. Satellite Video Conference. Muncie, IN. 1989.